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(54) ORGANIC ELECTROLUMINESCENT ELEMENT**(57)Abstract:**

PROBLEM TO BE SOLVED: To efficiently emit the blue light with excellent reliability by including a hole injection transporting compound and/or an electron injection transporting compound included in a hole transfer layer and/or an electron transfer layer as a host compound in a blue light emitting layer.

SOLUTION: As a host compound to be included in a blue light emitting layer, a compound, which emits the blue light, such as a phenylanthracene derivative is desirably used. In the case where the host material of the blue light emitting layer does not have the blue light emitting characteristic, a dopant can be used so as to change the light emitting characteristic for blue light emission, and as a dopant, a styryl group amine compound or the like is used. As the blue light emitting layer, a mixture layer of an electron injection and transfer compound (A) and a hole injection and transfer compound (B) can be used. In this case, the component A and the component B can be mixed evenly, or distributed in the film thickness direction so that concentration of the component B is higher at a hole transfer layer side and that concentration of the component A is higher at the electron transfer layer side.

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CLAIMS

[Claim(s)]

[Claim 1] The organic EL device with which it has a luminous layer, and the hole transportation layer and/or electronic transportation layer which adjoin this luminous layer, and is constituted above one layer in which said luminous layer contains a blue luminous layer, or two-layer, and said blue luminous layer contains the hole impregnation transportability compound and/or electron injection transportability compound in said hole transportation layer and/or an electronic transportation layer as a host compound.

[Claim 2] The organic EL device of claim 1 which is the compound in which a host compound carries out blue luminescence.

[Claim 3] The organic EL device of claim 2 with which a host compound is chosen from a phenyl anthracene derivative.

[Claim 4] The organic EL device of claim 1 which contains a dopant and carries out blue luminescence by the dopant.

[Claim 5] The organic EL device of claim 1 whose blue luminous layer it has a hole transportation layer and an electronic transportation layer, and is a mixolimnion of the hole impregnation transportability compound in said hole transportation layer and an electronic transportation layer, and an electron injection transportability compound.

[Claim 6] The organic EL device of claim 5 whose blue luminous layer is a mixolimnion of a phenyl anthracene derivative and the third class amine of aromatic series.

[Claim 7] The organic EL device of claims 5 or 6 with uniform concentration distribution of the hole impregnation transportability compound in a mixolimnion and an electron injection transportability compound.

[Claim 8] The hole impregnation transportability compound and electron injection transportability compound in a mixolimnion have concentration distribution in the direction of thickness, the concentration of a hole impregnation transportability compound is high at a hole transportation layer side, and it is the organic EL device of claims 5 or 6 with the high concentration of an electron injection transportability compound at an electronic transportation layer side.

[Claim 9] One organic EL device of claims 5-8 which are the mixolimnions by which the dopant was furthermore doped.

[Claim 10] One organic EL device of claims 5-9 which carry out blue luminescence by the whole mixolimnion.

[Claim 11] One organic EL device of claims 1-10 with which the component of the cathode established in an electronic transportation layer side contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.

[Claim 12] The organic EL device of claim 11 with which the component of cathode contains at least one sort of compounds chosen from the halogenide of Rb and Cs.

[Claim 13] The organic EL device with which it has cathode, the luminous layer more than one layer containing a blue luminous layer, or two-layer, a hole transportation layer and/or an impregnation layer, and an anode plate, and the component of said cathode contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.

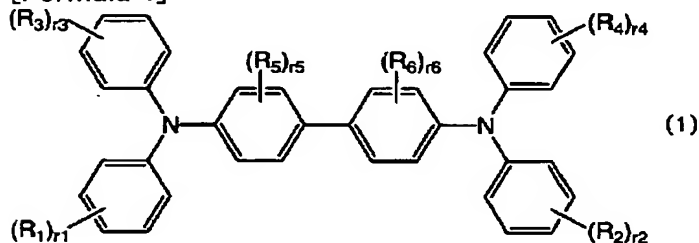
[Claim 14] The organic EL device of claim 13 which contains a phenyl anthracene derivative

as a compound in which a blue luminous layer carries out blue luminescence.

[Claim 15] The organic EL device of claims 13 or 14 with which hole transportation and/or an impregnation layer contain the third class amine of aromatic series.

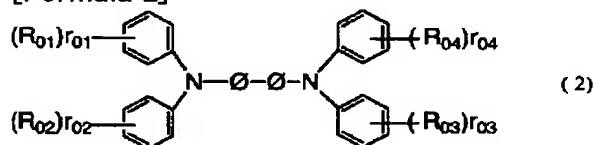
[Claim 16] The organic EL device of claim 15 with which the third class amine of aromatic series is chosen from the compound expressed with a formula (1) and a formula (2).

[Formula 1]

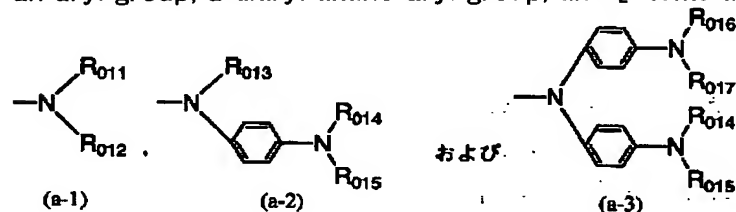


In [type (1) R1, R2, R3, and R4 An aryl group, an alkyl group, an alkoxy group, an aryloxy group, or a halogen radical is expressed, respectively. r1, r2, r3, and r4 It is the integer of 0-5, respectively, and r1, r2, r3, and r4 may combine mutually R1 comrades which adjoin at the time of two or more integers, R2 comrades, R3 comrades, and R4 comrades, respectively, and they may form a ring, respectively. R5 And R6 Expressing an alkyl group, an alkoxy group, the amino group, or a halogen radical, respectively, r5 and r6 are the integers of 0-4, respectively.]

[Formula 2]



In [type (2), phi expresses a phenylene group, and R01, R02, R03, and R04 are an alkyl group, an aryl group, a diaryl amino aryl group, and [Formula 3], respectively.



(ここで、R011、R012、R013、R014、R015、R016およびR017は、それぞれ、アリール基を表す。)

Expressing whether it is *****, at least one of R01-the R04 expresses a diaryl amino aryl group or the above (a-1) of - (a-3), and either. r01, r02, r03, and r04 are the integers of 0-5, respectively, and r01+r02+r03+r04 are one or more integers. When r01, r02, r03, and r04 are two or more integers, respectively, it may join together mutually, respectively and R01 adjoining comrades, R02 comrades, R03 comrades, and R04 comrades may form a ring.]

[Claim 17] The organic EL device of claims 15 or 16 with which it has a hole impregnation layer and a hole transportation layer, the hole impregnation layer by the side of an anode plate contains the compound expressed with a formula (2), and the hole transportation layer by the side of a luminous layer contains the compound expressed with a formula (1).

[Claim 18] One organic EL device of claims 1-17 which have the luminous layer of at least one layer in which luminescence wavelength differs from this other than a blue luminous layer.

[Claim 19] The organic EL device of claim 18 whose luminous layer of at least one layer from which a blue luminous layer differs in luminescence wavelength is a mixolimnion of a hole impregnation transportability compound and an electron injection transportability compound.

[Claim 20] The organic EL device of claim 19 which is the mixolimnion by which the dopant was furthermore doped.

[Claim 21] One organic EL device of claims 18-20 which have a two-layer luminous layer.

[Claim 22] One organic EL device of claims 18-20 which have the luminous layer of three layers.

[Claim 23] The organic EL device of claims 21 or 22 which carry out white luminescence.

[Claim 24] One organic EL device of claims 1-23 which modulate the luminescent color combining this color filter using a color filter.

[Claim 25] The organic EL device of claim 24 which counters mutually and with which at least one side has the electrode of a transparent pair, the organic layer which contains said luminous layer in inter-electrode [of this pair] is pinched, and said color filter is installed in the transparent electrode side of the electrode of this pair.

[Claim 26] The organic EL device of claim 24 with which each consists of two or more electrodes, and it crosses mutually, and it has XY matrix type electrode of a pair at least with transparent one side arranged in the location which counters, and the organic layer which contains said luminous layer in inter-electrode [crossing / said] is pinched, the amount of this intersection forms a pixel, and said color filter is installed in the transparent electrode side of this pixel.

[Claim 27] The organic EL device of claim 26 with which it is the periphery of said pixel and the black matrix is installed near the installation part of said color filter.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to an organic electroluminescence (electroluminescence) component.

[0002]

[Description of the Prior Art] An organic EL device is a component which emits light using emission (fluorescence and phosphorescence) of the light at the time of making an exciton (exciton) generate and this exciton deactivating by having the configuration whose thin film containing a fluorescence organic compound was pinched in cathode and an anode plate, and making an electron and an electron hole pour in and recombine with a thin film.

[0003] An organic EL device is 100 – 100,000 cd/m² at the low battery not more than 10V. Field luminescence of high brightness of extent is possible. Moreover, luminescence from blue to red is possible by choosing the class of fluorescent material.

[0004] On the other hand, the trouble of an organic EL device is that a luminescence life is short and preservation endurance and dependability are low, and is the physical change (ununiformity-ization of an interface arises by crystal domain growth etc., and it becomes the cause of degradation, the short circuit, and dielectric breakdown of the charge impregnation ability of a component.) of (1) organic compound as this cause. If especially a with a molecular weight of 500 or less low molecular weight compound is used, an appearance and growth of crystal grain will take place, and membranous will fall remarkably. Even if ruined, an appearance and growth of remarkable crystal grain take place, decline in luminous efficiency and leak of a current are caused, and it stops moreover, emitting light. Moreover, it also becomes the cause of the dark spot which is a partial non-light-emitting part.

[0005] (2) Oxidation and exfoliation of cathode (although Na-K-Li-Mg-calcium-aluminum etc. has been used for cathode as a small metal of a work function in order to make impregnation of an electron easy, as for these metals, it reacts with the moisture in atmospheric air, and oxygen, or exfoliation with an organic layer and cathode takes place, and charge impregnation becomes impossible) When membranes are especially formed on a spin coat etc. using a high molecular compound etc., the residual solvent and moisture, and decomposition product at the time of membrane formation promote oxidation reaction of an electrode, exfoliation of an electrode takes place, and a partial non-light-emitting part is produced.

[0006] (3) Luminous efficiency is low and there is much calorific value (since a current is passed in an organic compound, an organic compound must be put on the bottom of high field strength, and generation of heat is not escaped.). Degradation and destruction of a component take place by melting, crystallization, the pyrolysis, etc. of an organic compound for the heat.

[0007] (4) Photochemistry-change, electrochemical change, etc. of an organic compound layer (the organic substance deteriorates by passing a current to the organic substance, defects, such as a current trap and an exciton trap, are produced, and component degradation of the rise of driver voltage, a fall of brightness, etc. takes place.) are mentioned.

[0008] Although an organic EL device enables implementation of multicolor luminescence as mentioned above, the laminating mold white luminescence organic EL device is proposed as a thing corresponding to the formation of multicolor luminescence of an organic EL device [Yoshiharu Sato, Shingaku Giho, and OME-94-78 (1995-03)]. The luminous layer in this case

carries out the laminating of the red luminous layer which doped the red fluorochrome (P-660, DCM1) to the green luminous layer and tris (8-quinolinolato) aluminum using the blue luminous layer which used the zincky oxazole complex, and tris (8-quinolinolato) aluminum.

[0009] Moreover, previously, as a thing aiming at multicolor luminescence, with the above components, since the degree of freedom of adjustment of material selection or the luminescent color is restricted greatly, this invention person etc. has proposed the technique which carries out multicolor luminescence by addition of a dopant (WO 98/No. 08360). It is changing a mixing ratio and a dopant kind, the luminescence property is changed, and, specifically, multicolor luminescence is enabled. [in / the dopant of rubrene or a coumarin derivative is added to a mixolimnion with an N'-tetrakis-(3-biphenyl-1-IRU) benzidine, and / tris (8-quinolinolato) aluminum, N, N, N', and / a mixolimnion]

[0010] However, the luminescent color indicated concretely there does not correspond to red - green, and does not correspond to blue.

[0011] Then, although to be stabilized and to obtain the blue luminescent color is desired, there is a characteristic problem which accompanies it and selection of the various ingredients combined only not only in luminescent material is needed.

[0012]

[Problem(s) to be Solved by the Invention] Blue luminescence light is offering the organic EL device excellent in the dependability acquired efficiently, and the purpose of this invention is offering a long lasting organic EL device by high brightness possible [the correspondence to multicolor luminescence which includes blue luminescence further]. Furthermore, production of a multicolor luminescence organic electroluminescence display is offering the organic EL device which becomes possible by combining a color filter further taking advantage of the outstanding property.

[0013]

[Means for Solving the Problem] Such a purpose is attained by following this invention.

(1) The organic EL device with which it has a luminous layer, and the hole transportation layer and/or electronic transportation layer which adjoin this luminous layer, and is constituted above one layer in which said luminous layer contains a blue luminous layer, or two-layer, and said blue luminous layer contains the hole impregnation transportability compound and/or electron injection transportability compound in said hole transportation layer and/or an electronic transportation layer as a host compound.

(2) The organic EL device of the above (1) which is the compound in which a host compound carries out blue luminescence.

(3) The organic EL device of the above (2) with which a host compound is chosen from a phenyl anthracene derivative.

(4) The organic EL device of the above (1) which contains a dopant and carries out blue luminescence by the dopant.

(5) The organic EL device of the above (1) whose blue luminous layer it has a hole transportation layer and an electronic transportation layer, and is a mixolimnion of the hole impregnation transportability compound in said hole transportation layer and an electronic transportation layer, and an electron injection transportability compound.

(6) The organic EL device of the above (5) whose blue luminous layer is a mixolimnion of a phenyl anthracene derivative and the third class amine of aromatic series.

(7) The above (5) with uniform concentration distribution of the hole impregnation transportability compound in a mixolimnion and an electron injection transportability compound, or (6) organic EL devices.

(8) the hole impregnation transportability compound and electron injection transportability compound in a mixolimnion — the direction of thickness — concentration distribution — having — a hole transportation layer side — the concentration of a hole impregnation transportability compound — high — an electronic transportation layer side — the above (5) with the high concentration of an electron injection transportability compound, or the organic EL device of (6).

(9) One organic EL device of above-mentioned (5) - (8) which is the mixolimnion by which the

dopant was furthermore doped.

(10) One organic EL device of above-mentioned (5) – (9) which carries out blue luminescence by the whole mixolimnion.

(11) One organic EL device of above-mentioned (1) – (10) with which the component of the cathode established in an electronic transportation layer side contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.

(12) The organic EL device of the above (11) with which the component of cathode contains at least one sort of compounds chosen from the halogenide of Rb and Cs.

(13) The organic EL device with which it has cathode, the luminous layer more than one layer containing a blue luminous layer, or two-layer, a hole transportation layer and/or an impregnation layer, and an anode plate, and the component of said cathode contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.

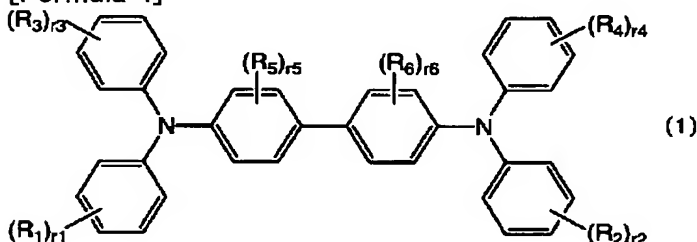
(14) The organic EL device of the above (13) which contains a phenyl anthracene derivative as a compound in which a blue luminous layer carries out blue luminescence.

(15) The above (13) whose hole transportation and/or impregnation layer contain the third class amine of aromatic series, or (14) organic EL devices.

(16) The organic EL device of the above (15) with which the third class amine of aromatic series is chosen from the compound expressed with a formula (1) and a formula (2).

[0014]

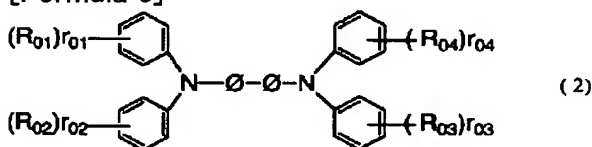
[Formula 4]



[0015] In [type (1) R1, R2, R3, and R4 An aryl group, an alkyl group, an alkoxy group, an aryloxy group, or a halogen radical is expressed, respectively. r1, r2, r3, and r4 It is the integer of 0–5, respectively, and r1, r2, r3, and r4 may combine mutually R1 comrades which adjoin at the time of two or more integers, R2 comrades, R3 comrades, and R4 comrades, respectively, and they may form a ring, respectively. R5 And R6 Expressing an alkyl group, an alkoxy group, the amino group, or a halogen radical, respectively, r5 and r6 are the integers of 0–4, respectively.]

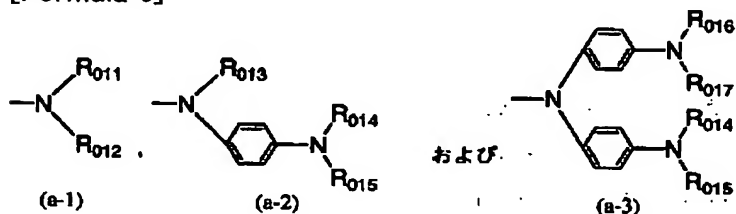
[0016]

[Formula 5]



[0017] In [type (2), phi expresses a phenylene group, and R01, R02, R03, and R04 are an alkyl group, an aryl group, a diaryl amino aryl group, and [0018], respectively.

[Formula 6]



(ここで、R011、R012、R013、R014、R015、R016およびR017は、それぞれ、アリール基を表す。)

[0019] Expressing whether it is ~~*****~~, at least one of R01–the R04 expresses a diaryl amino aryl group or the above (a-1) of – (a-3), and either. r01, r02, r03, and r04 are the integers of 0–5, respectively, and $r01+r02+r03+r04$ are one or more integers. When r01, r02, r03, and r04 are two or more integers, respectively, it may join together mutually, respectively and R01 adjoining comrades, R02 comrades, R03 comrades, and R04 comrades may form a ring.]

(17) The above (15) whose hole transportation layer by the side of a luminous layer have a hole impregnation layer and a hole transportation layer, the hole impregnation layer by the side of an anode plate contains the compound expressed with a formula (2), and contains the compound expressed with a formula (1), or (16) organic EL devices.

(18) One organic EL device of above-mentioned (1) – (17) which has the luminous layer of at least one layer in which luminescence wavelength differs from this other than a blue luminous layer.

(19) The organic EL device of the above (18) whose luminous layer of at least one layer from which a blue luminous layer differs in luminescence wavelength is a mixolimnion of a hole impregnation transportability compound and an electron injection transportability compound.

(20) The organic EL device of the above (19) which is the mixolimnion by which the dopant was furthermore doped.

(21) One organic EL device of above-mentioned (18) – (20) which has a two-layer luminous layer.

(22) One organic EL device of above-mentioned (18) – (20) which has the luminous layer of three layers.

(23) The above (21) which carries out white luminescence, or (22) organic EL devices.

(24) One organic EL device of above-mentioned (1) – (23) which modulates the luminescent color combining this color filter using a color filter.

(25) The organic EL device of the above (24) which counters mutually and with which at least one side has the electrode of a transparent pair, the organic layer which contains said luminous layer in inter-electrode [of this pair] is pinched, and said color filter is installed in the transparent electrode side of the electrode of this pair.

(26) The organic EL device of the above (24) with which each consists of two or more electrodes, and it crosses mutually, and it has XY matrix type electrode of a pair at least with transparent one side arranged in the location which counters, and the organic layer which contains said luminous layer in inter-electrode [crossing / said] is pinched, the amount of this intersection forms a pixel, and said color filter is installed in the transparent electrode side of this pixel.

(27) The organic EL device of the above (26) with which it is the periphery of said pixel and the black matrix is installed near the installation part of said color filter.

[0020]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail. The compound which has the blue luminous layer which uses as a host ingredient the hole impregnation transportability compound and/or electron injection transportability compound in the hole transportation layer which adjoins a luminous layer, and/or an electronic transportation layer, and has a blue luminous layer again, or is chosen from the chloride and oxide of alkali metal as a cathode material is used for the organic EL device of this invention. Preferably, it has these configurations and, as for a blue luminous layer, it is desirable that it is the mixolimnion of the aforementioned hole impregnation transportability compound and an electron injection transportability compound. Furthermore, it explains in full detail.

[0021] The organic EL device of <blue luminous layer> this invention has a blue luminous layer. As a compound in this case which carries out blue luminescence, a phenyl anthracene derivative is used preferably. These are indicated by JP,8-12600,A. Especially, the compound expressed with a formula (A) as a phenyl anthracene derivative is desirable.

A1 –L–A2 (A)

[0022] It sets at a ceremony (A) and is A1. And A2 A monochrome (alt.permutation phenyl)

anthryl radical or a JI (alt.permutation phenyl) anthryl radical is expressed respectively, and these may be the same or may differ. L expresses single bond or the connection radical of bivalence.

[0023] A1 and A2 The monochrome (alt.permutation phenyl) phenyl anthryl radical or JI (alt.permutation phenyl) phenyl anthryl radical expressed has an aryl group, a complex ring radical, or an aryl ethenyl radical in the 2nd place of a phenyl group, or the 6th place (it is the ortho position to the joint location to an anthracene ring). Moreover, you may have a substituent in addition to the ortho position, an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, the amino group, etc. may be mentioned as a substituent in the case of having a substituent, and these substituents may be permuted further. About these substituents, it mentions later.

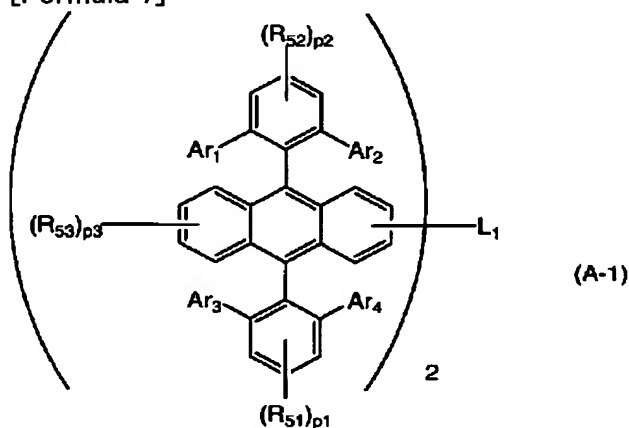
[0024] Moreover, as for the joint location of the phenyl group in an anthracene ring, it is desirable that they are the 9th place of an anthracene ring and the 10th place.

[0025] In a formula (A), although L expresses the radical of single bond or bivalence, the arylene radical between which you may be placed by the alkylene group etc. as a radical of the bivalence expressed with L is desirable. About such an arylene radical, it mentions later.

[0026] Also in the phenyl anthracene derivative shown by the formula (A), what is shown by the formula (A-1) and the formula (A-2) is desirable.

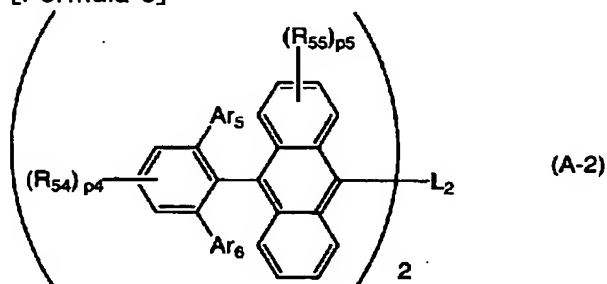
[0027]

[Formula 7]



[0028]

[Formula 8]



[0029] It sets at a ceremony (A-1), and is Ar1 -Ar4. A hydrogen atom, an aryl group, a complex ring radical, or an aryl ethenyl radical is expressed respectively, and it is Ar1. And Ar2 On the other hand, it is Ar3 to a row at least. And Ar4 At least one side is an aryl group, a complex ring radical, or an aryl ethenyl radical respectively. R51 and R52 express an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, or the amino group respectively, and these may be the same or may differ. p1 and p2 express the integer of 0-3 respectively, and when p1 and p2 are two or more integers respectively, R51 comrades and R52 comrades may be respectively the same, or may differ from each other. R53 expresses an alkyl group or an aryl group, and p3 expresses the integer of 0-3 respectively. When p3 is two or more

integers, R53 may be respectively the same or may differ. L1 Single bond or an arylene radical may be expressed and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene.

[0030] It sets at a ceremony (A-2), and is Ar5. And Ar6 A hydrogen atom, an aryl group, a complex ring radical, or an aryl ethenyl radical is expressed respectively, and it is Ar5. And Ar6 At least one side is an aryl group, a complex ring radical, or an aryl ethenyl radical. R54 expresses an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, or the amino group respectively, and these may be the same or may differ. p4 expresses the integer of 0-3 respectively, and when p4 is two or more integers respectively, R54 comrades may be respectively the same or may differ. R55 expresses an alkyl group or an aryl group, and p5 expresses the integer of 0-4 respectively. When p5 is two or more integers, R55 may be respectively the same or may differ. L2 Single bond or an arylene radical may be expressed and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene. L2 may express single bond or an arylene radical, and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene.

[0031] Ar1 -Ar4 And as an aryl group expressed with R51-R53, the thing of carbon numbers 6-20 may be desirable, and may have substituents, such as a phenyl group and a tolyl group, further. Specifically, a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a naphthyl group, an anthryl radical, a biphenyl radical, a phenyl anthryl radical, a tolyl anthryl radical, etc. are mentioned.

[0032] Ar1 -Ar4 As a complex ring radical expressed A furil radical, a benzo furil radical, a thienyl group, a BICHNIENIRU radical, a benzo thienyl group, A pyrrolyl radical, N-allyl compound pyrrolyl radical, an indolyl radical, a pyridyl radical, a bipyridyl radical, A quinolyl radical, a quinoxalyl radical, an oxazole radical, a benzo oxazole radical, An OKISA diazole radical, a thiazole radical, a benzothiazole radical, a thiadiazole radical, an imidazole group, etc. are desirable. Further You may have substituents, such as a with a carbon number of 42 or less aryl group, a with a carbon number of 12 or less alkyl group, an alkoxy group, an aryloxy radical, an amino group, a cyano group, and a nitro group. Specifically, a phenyl group, a biphenyl (o-, m-, p-) radical, a naphthyl group (1 2), a methyl group, an ethyl group, a propyl group, butyl, a methoxy group, an ethoxy radical, a phenoxy group, a tolyl group (o-, m-, p-), etc. are mentioned as a substituent.

[0033] As Ar1 -Ar4 and an aryl ethenyl radical expressed with R51 and R52, 2-phenyl ethenyl radical, 2, and 2-diphenyl ethenyl radical etc. may be desirable, and may have substituents, such as an aryl group, an alkyl group, an alkoxy group, an aryloxy radical, an amino group, a cyano group, and a nitro group, further. Specifically, a phenyl group, a biphenyl (o-, m-, p-) radical, a naphthyl group (1 2), a methyl group, an ethyl group, a propyl group, butyl, a methoxy group, an ethoxy radical, a phenoxy group, a tolyl group (o-, m-, p-), etc. are mentioned as a substituent.

[0034] As an alkyl group expressed with R51-R53, you may have branching also by the shape of a straight chain, and the alkyl group which is not permuted [the permutation of 1-4 or] is desirable to carbon numbers 1-10 and a pan. Especially, the alkyl group which is not permuted [of carbon numbers 1-4] is desirable, and a methyl group, an ethyl group, a propyl group (n-, i-), butyl (n-, i-, s-, t-), etc. are specifically mentioned.

[0035] As an alkoxy group expressed with R51 and R52, the thing of 1-6 has the desirable carbon number of an alkyl group part, and a methoxy group, an ethoxy radical, etc. are specifically mentioned. The alkoxy group may be permuted further.

[0036] Although the amino group expressed with R51 and R52 has a substituent also in no permuting, it is desirable to have a substituent and alkyl groups (a methyl group, ethyl group, etc.), aryl groups (phenyl group etc.), etc. are mentioned as a substituent in this case. Specifically, a diethylamino radical, a diphenylamino radical, the JI (m-tolyl) amino group, etc. are mentioned.

[0037] In a formula (A-1), respectively, p1 and p2 express the integer of 0, or 1-3, and it is especially desirable that it is 0-2. As for R51 and R52, it is desirable that p1 and p2 are a

methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1–3 and.

[0038] In a formula (A-1), respectively, p3 expresses the integer of 0–3, and it is especially desirable that it is 0–2. As for R53, it is desirable that p3 is a methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1–3 and.

[0039] In a formula (A-1), when R51–R53 may be the same, or you may differ and two or more R51, R52, and R53 exist respectively, R51 comrades, R52 comrades, and R53 comrades may be respectively the same, or may differ from each other.

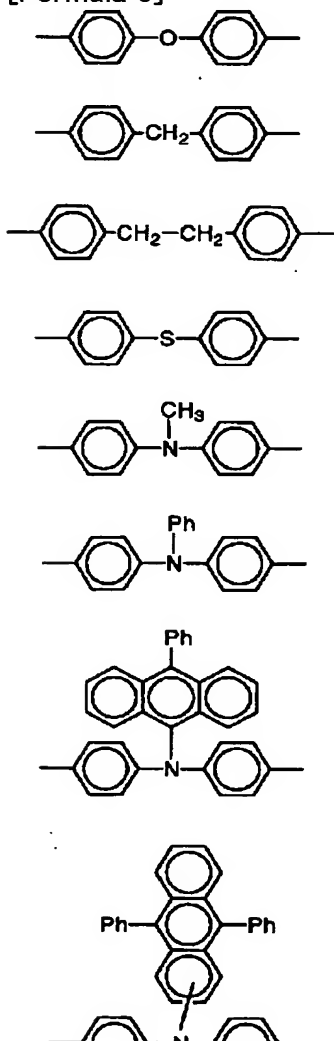
[0040] It sets at a ceremony (A-1), and is L1. Single bond or an arylene radical is expressed. L1 As an arylene radical expressed, having not permuted is desirable, and what the arylene radical beyond others, two pieces, or it specifically connected directly is mentioned.

[radicals /, such as a phenylene group, a biphenylene radical and anthrylene group, / usual / arylene] L1 If it carries out, a single bond, p-phenylene group, 4, and 4'-biphenylene radical etc. is desirable.

[0041] Moreover, L1 An alkylene group, –O–, –S–, or –NR– may intervene, and two pieces thru/or the arylene radical beyond it may connect the arylene radical expressed. Here, R expresses an alkyl group or an aryl group. A methyl group, an ethyl group, etc. are mentioned as an alkyl group, and a phenyl group etc. is mentioned as an aryl group. A1 besides the above-mentioned phenyl group with an aryl group desirable especially, and A2 you may be — further — a phenyl group — A1 Or A2 You may permute. Moreover, as an alkylene group, a methylene group, ethylene, etc. are desirable. The example of such an arylene radical is shown below.

[0042]

[Formula 9]





[0043] Next, R51 or R52 if a formula (A-2) is explained, [in / on a formula (A-2) and / in R54 / a formula (A-1)] Moreover, for R55, R53 and p4 in a formula (A-1) are [p1 or p2 in a formula (A-1), and] L2 further. It is synonymous with L1 in a formula (A-1) respectively, and the same is said of a desirable thing.

[0044] Moreover, in a formula (A-2), respectively, p5 expresses the integer of 0-4, and it is desirable [5] especially that it is 0-2. As for R55, it is desirable that p5 is a methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1-3 and.

[0045] In a formula (A-2), when R54 and R55 may be the same, or you may differ and two or more R54 and R55 exist respectively, R54 comrades and R55 comrades may be respectively the same, or may differ from each other.

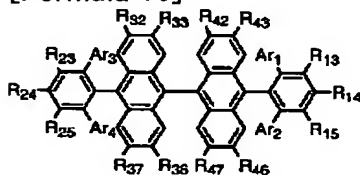
[0046] It sets at a ceremony (A-1), and is Ar1. And Ar2 On the other hand, it is Ar3 at least. And Ar4 It is desirable that at least one side is a phenyl group, a biphenyl radical, a terphenyl radical, a styryl radical, a phenyl styryl radical, a diphenyl styryl radical, a thienyl group, a methyl thienyl group, a phenyl thienyl group, or a FENI ruby thienyl group. Furthermore, it is Ar1. And Ar2 On the other hand, it is Ar3 at least. And Ar4 At least one side is a phenyl group, a biphenyl radical, or a terphenyl radical, and it is L1. It is desirable that it is single bond.

[0047] It sets at a ceremony (A-2), and is Ar5. And Ar6 It is desirable that at least one side is a phenyl group, a biphenyl radical, a terphenyl radical, a styryl radical, a phenyl styryl radical, a diphenyl styryl radical, a thienyl group, a methyl thienyl group, a phenyl thienyl group, or a FENI ruby thienyl group. Furthermore, it is Ar5. And Ar6 At least one side is a phenyl group, a biphenyl radical, or a terphenyl radical, and it is L2. It is desirable that it is single bond.

[0048] Although the compound expressed with a formula (A-1) and a formula (A-2) is illustrated below, this invention is not limited to these. When the combination of a formula and a radical shows here and R32-37 grade shows collectively, only a substituent shall be shown and -H shows altogether at the time of a hydrogen atom. Moreover, a cable address shall be shown timely (in addition, Toly is a tolyl group).

[0049]



[Formula 10]



[0050]







[Formula 11]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
1-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
1-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
1-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
1-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H

1-10			-H	-H	-H
1-11	-Ph	-H	-Ph	-H	-H
1-12	-Ph	-H	-Ph	-H	-H
1-13	-Ph	-H	-Ph	-H	-H
1-14	-Ph	-H	-Ph	-H	-H
1-15	-Ph	-H	-Ph	-H	-H
1-16	-Ph	-H	-Ph	-H	-H
1-17	-Ph	-H	-Ph	-H	-H

[0051]





[Formula 12]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-18	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-19	-Ph	-Ph	-Ph	-Ph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-20	-Ph	-Ph	-Ph	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-21	-Ph	-Ph	-Ph	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-22	-Ph	-Ph	-Ph	-Ph	-Me	-H	-H	-Me	-H	-H	-H	-H
1-23	-Ph	-Ph	-Ph	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H
1-24	-Ph	-Ph	-Ph	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H
1-25	-Ph	-Ph	-Ph	-Ph	-H	-OPh	-H	-H	-OPh	-H	-H	-H
1-26	-Ph	-Ph	-Ph	-Ph	-H	-OMe	-H	-H	-OMe	-H	-H	-H
1-27	-Ph	-Ph	-Ph	-Ph	-H		-H		-H	-H	-H	-H
1-28	-Ph	-Ph	-Ph	-Ph	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
1-29	-Ph	-Ph	-Ph	-Ph	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
1-30	-Ph	-Ph	-Ph	-Ph	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-31	-Ph	-Ph	-Ph	-Ph	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
1-32	-Ph	-Ph	-Ph	-Ph	-H	-N(Toly) ₂	-H	-H	-N(Toly) ₂	-H	-H	-H
1-33	-Ph	-Ph	-Ph	-Ph	-H		-H	-H		-H	-H	-H
1-34	-Ph	-Ph	-Ph	-Ph	-H		-H	-H		-H	-H	-H

[0052]

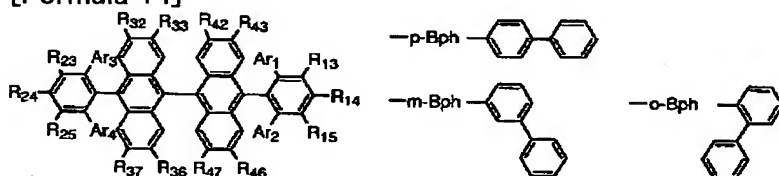
[Formula 13]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-35	-p-Bph	-H	-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-36	-p-Bph	-H	-p-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-37	-p-Bph	-H	-p-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-38	-p-Bph	-H	-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-39	-m-Bph	-H	-m-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H

1-40	-m-Bph	-H	-m-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-41	-m-Bph	-H	-m-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-42	-m-Bph	-H	-m-Bph	-H	-H	-H	-Ph	-H	-H	-Ph	-H
1-43	-o-Bph	-H	-o-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-44	-o-Bph	-H	-o-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-45	-o-Bph	-H	-o-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-46	-o-Bph	-H	-o-Bph	-H	-H	-H	-Ph	-H	-H	-Ph	-H
1-47	-p-Bph	-H	-p-Bph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H
1-48	-p-Bph	-H	-p-Bph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H
1-49	-p-Bph	-H	-p-Bph	-H	-H	-N(Toly) ₂	-H	-H	-N(Toly) ₂	-H	-H
1-50	-p-Bph	-H	-p-Bph	-H	-H		-H	-H		-H	-H
1-51	-p-Bph	-H	-p-Bph	-H	-H		-H	-H		-H	-H





[0053]

[Formula 14]



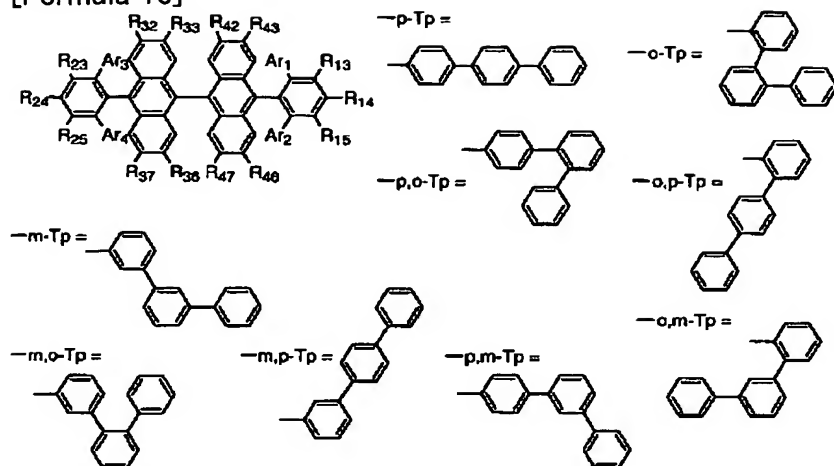
[0054]

[Formula 15]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-52	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-53	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-54	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-55	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-56	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-57	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-58	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-59	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-60	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-61	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-62	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-63	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-64	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-65	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
1-66	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-N(Toly) ₂	-H	-H	-N(Toly) ₂	-H	-H	-H
1-67	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H		-H	-H		-H	-H	-H
1-68	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H		-H	-H		-H	-H	-H

[0055]

[Formula 16]



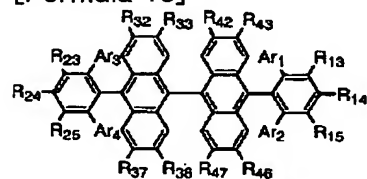
[0056]

[Formula 17]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-69	-p-Tp	-p-Tp	-p-Tp	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-70	-p-Tp	-H	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-71	-p-Tp	-H	-p-Tp	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-72	-p-Tp	-H	-p-Tp	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-73	-p-Tp	-H	-p-Tp	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-74	-p-Tp	-CH ₃	-p-Tp	-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-75	-m-Tp	-m-Tp	-m-Tp	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-76	-m-Tp	-H	-m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-77	-o-Tp	-o-Tp	-o-Tp	-o-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-78	-o-Tp	-H	-o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-79	-p,o-Tp	-H	-p,o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-80	-o,p-Tp	-H	-o,p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-81	-p,m-Tp	-H	-p,m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-82	-m,p-Tp	-H	-m,p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-83	-m,o-Tp	-H	-m,o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-84	-o,m-Tp	-H	-o,m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H

[0057]

[Formula 18]



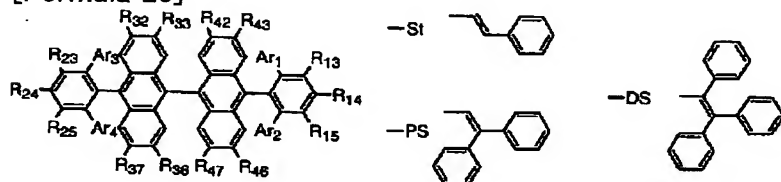
[0058]

[Formula 19]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-85	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₄₃ =Ph	R ₄₅ =Ph
1-86	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₇ =Ph	R ₄₃ =Ph R ₄₅ =Ph
1-87	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₆ =Ph	R ₄₃ =Ph R ₄₇ =Ph
1-88	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph	R ₄₃ =Ph
1-89	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₇ =Ph	R ₄₃ =Ph R ₄₅ =Ph
1-90	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₆ =Ph	R ₄₃ =Ph R ₄₇ =Ph
1-91	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
1-92	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₇ =Me	R ₄₃ =Me R ₄₅ =Me
1-93	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₆ =Me	R ₄₃ =Me R ₄₇ =Me
1-94	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
1-95	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₇ =Me	R ₄₃ =Me R ₄₅ =Me
1-96	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₆ =Me	R ₄₃ =Me R ₄₇ =Me

[0059]

[Formula 20]



[0060]

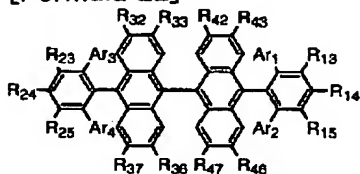
[Formula 21]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-97	-St	-H	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-98	-St	-H	-St	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-99	-St	-H	-St	-H	-H	-Ph	-H	-H	-Ph	-Ph	-H	-H
1-100	-St	-H	-St	-H	-H	-H	-Ph	-H	-H	-H	-H	-H
1-101	-St	-St	-St	-St	-H	-H	-H	-H	-H	-H	-H	-H
1-102	-St	-St	-St	-St	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-103	-St	-St	-St	-St	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-104	-St	-St	-St	-St	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-105	-St	-H	-St	-H	-H	-St	-H	-H	-H	-St	-H	-H
1-106	-St	-St	-St	-St	-H	-St	-H	-H	-St	-H	-H	-H
1-107	-PS	-H	-PS	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-108	-PS	-PS	-PS	-PS	-H	-H	-H	-H	-H	-H	-H	-H

1-109	-PS	-H	-PS	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-110	-DS	-H	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-111	-DS	-DS	-DS	-DS	-H	-H	-H	-H	-H	-H	-H	-H
1-112	-DS	-H	-DS	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H

[0061]

[Formula 22]



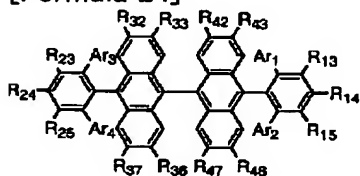
[0062]

[Formula 23]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-113		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-114		-Ph		-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-115		-CH ₃		-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-116		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-117		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-118		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-119		-H		-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-120					-H	-H	-H	-H	-H	-H	-H	-H

[0063]

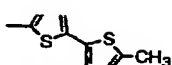
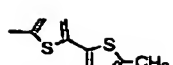
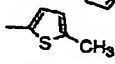
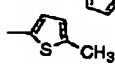
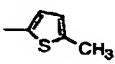
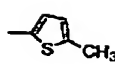
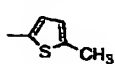
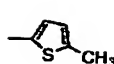
[Formula 24]



[0064]

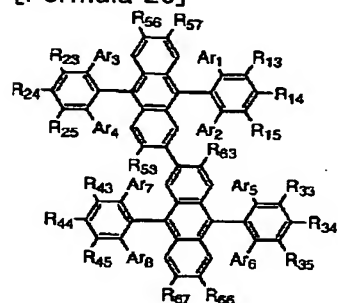
[Formula 25]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-121		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-122		-Ph		-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-123		-CH ₃		-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-124		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-125		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H

1-126		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-127		-H		-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-128					-H	-H	-H	-H	-H	-H	-H	-H

[0065]

[Formula 26]



[0066]

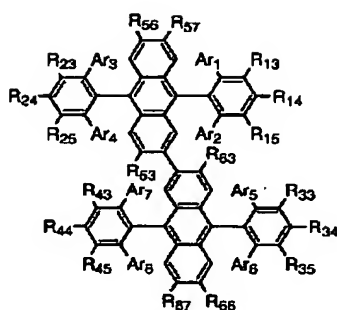
[Formula 27]

上記式中のAr₁～Ar₈ (次頁に続く)

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	Ar ₅	Ar ₆	Ar ₇	Ar ₈
2-1	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-2	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph
2-3	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-4	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph
2-5	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-6	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-7	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-8	-Ph	-CH ₃	-Ph	-CH ₃	-Ph	-CH ₃	-Ph	-CH ₃
2-9	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-10	-Ph	-H	-Ph	-H	-Ph	-H	-Ph	-H
2-11	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H
2-12	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph
2-13	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H
2-14	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-p-Bph
2-15	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H
2-16	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H	-p-Bph	-H
2-17	-m-Bph	-H	-m-Bph	-H	-m-Bph	-H	-m-Bph	-H
2-18	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-m-Bph
2-19	-o-Bph	-H	-o-Bph	-H	-o-Bph	-H	-o-Bph	-H
2-20	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-o-Bph

[0067]

[Formula 28]



[0068]

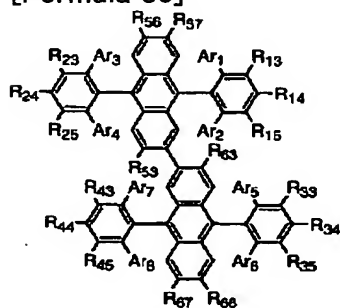
[Formula 29]

上記式中のR₁₃~R₁₅等 (前頁の続き)

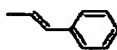
No.	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₃	R ₃₄	R ₃₅	R ₄₃	R ₄₄	R ₄₅	R ₅₆₋₅₇	R ₆₆₋₆₇
2-1	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-2	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-3	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-4	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-5	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
2-6	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2-7	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-H
2-8	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-9	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph	R ₆₆ =Ph
2-10	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph R ₅₇ =Ph	R ₆₆ =Ph R ₆₇ =Ph
2-11	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-12	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-13	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-14	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-15	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
2-16	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2-17	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-18	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-19	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-20	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H

[0069]

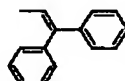
[Formula 30]



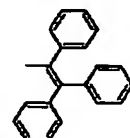
-Si



-PS



-DS



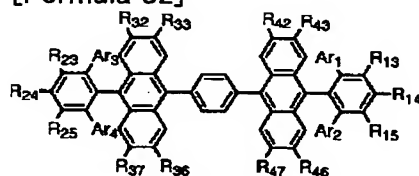
[0070]

[Formula 31]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	Ar ₅	Ar ₆	Ar ₇	Ar ₈	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₃	R ₃₄	R ₃₅	R ₄₃	R ₄₄	R ₄₅	R ₅₆₋₅₇	R ₆₆
2-21	-St	-H	-St	-H	-St	-H	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-22	-St	-St	-St	-St	-St	-St	-St	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-23	-St	-H	-St	-H	-St	-H	-St	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-24	-St	-St	-St	-St	-St	-St	-St	-St	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-25	-PS	-H	-PS	-H	-PS	-H	-PS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-26	-PS	-PS	-PS	-H	-PS	-PS	-PS	-PS	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-27	-DS	-H	-DS	-H	-DS	-H	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-28	-DS	-DS	-DS	-DS	-DS	-DS	-DS	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-29	-St	-St	-St	-St	-St	-St	-St	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph
2-30	-St	-H	-St	-H	-St	-H	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph R ₅₇ =Ph
																						R ₆₆ = R ₆₇ =

[0071]

[Formula 32]



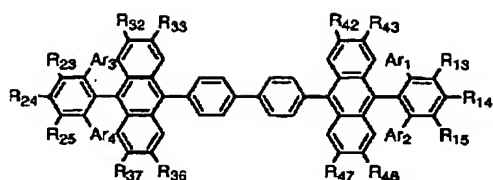
[0072]

[Formula 33]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
3-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
3-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
3-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
3-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
3-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
3-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
3-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
3-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
3-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
3-10	-Ph	-H	-Ph	-H	-H		-H		-H	-H	-H	-H
3-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
3-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
3-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
3-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
3-15	-Ph	-H	-Ph	-H	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
3-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
3-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H

[0073]

[Formula 34]



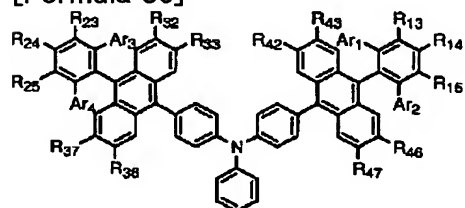
[0074]

[Formula 35]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
4-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
4-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
4-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
4-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
4-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
4-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
4-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
4-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
4-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
4-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
4-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
4-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
4-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
4-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
4-15	-Ph	-H	-Ph	-H	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
4-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
4-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H







[0075]

[Formula 36]



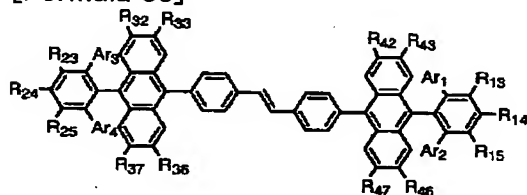
[0076]

[Formula 37]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
5-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
5-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
5-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
5-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
5-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
5-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
5-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
5-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
5-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
5-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
5-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
5-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
5-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
5-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
5-15	-Ph	-H	-Ph	-H	-H	-N(Tol) ₂	-H	-H	-N(Tol) ₂	-H	-H	-H
5-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
5-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H



[0077]





[Formula 38]



[0078]

[Formula 39]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
6-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
6-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
6-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
6-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
6-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
6-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
6-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
6-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
6-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
6-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
6-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H

6-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
6-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
6-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
6-15	-Ph	-H	-Ph	-H	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
6-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
6-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H

[0079] JP,8-12600,A etc. can be referred to about the synthesis method of the phenyl anthracene derivative of this invention.

[0080] These compounds may use two or more sorts together, using only one sort.

[0081] As thickness in the case of considering as a blue luminous layer, using a phenyl anthracene derivative as a blue luminescence compound, 1-500nm is desirable and is 10-200nm more preferably.

[0082] To such a luminous layer, a dopant may be doped in the form which can hold blue luminescence. As such a dopant, the styryl system amine compound of an indication etc. is mentioned to WO 98/No. 08360 and JP,8-239655,A. About a styryl system amine compound, it mentions later. As for the amount of the dopant used, it is desirable in a luminous layer that it is 0.1 to 20 mass %. The stability of luminous efficiency or a component improves by use of a dopant.

[0083] Moreover, a blue luminous layer may contain the electron injection transportability compound or hole impregnation transportability compound used for the electronic transportation layer adjoined and prepared in a luminous layer, and a hole transportation layer as a host ingredient. Using the phenyl anthracene derivative specifically used for the electronic transportation layer as a host ingredient etc. is mentioned. Since a phenyl anthracene derivative has a blue luminescence property, it can carry out blue luminescence by itself, but when a host ingredient is what does not have a blue luminescence property, it changes a luminescence property and it may be made to carry out blue luminescence by using a dopant. such — if a dopant is carried out, the above-mentioned styryl system amine compound etc. is mentioned.

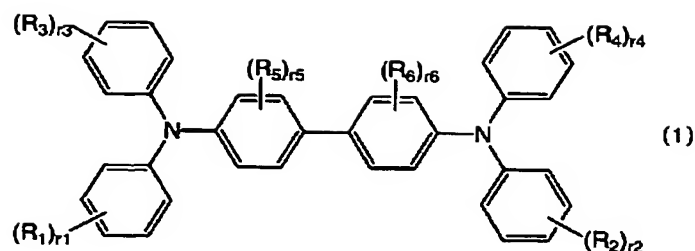
[0084] It is desirable to make the thickness ratio of the electronic transportation layer or hole transportation layer which contains the compound used as a host ingredient with such a configuration, and a luminous layer luminous layer thickness / electronic transportation layer, or hole transportation thickness set to 1 / 100 - 100/1.

[0085] Moreover, a blue luminous layer may be a mixolimnion of an electron injection transportability compound and a hole impregnation transportability compound, and such a mode is desirable. Especially, the same thing as the compound used for the electronic transportation layer adjoined and prepared in a luminous layer and the hole transportation layer of either compound of an electron injection transportability compound and a hole impregnation transportability compound is desirable. It is adjoining a luminous layer, preparing an electronic transportation layer and a hole transportation layer preferably, and considering as the mixture of these compounds using the electron injection transportability compound in these layers, and a hole impregnation transportability compound especially.

[0086] Specifically, it is desirable to use the third class amine of aromatic series in a hole transportation layer as a hole impregnation transportability compound, using the phenyl anthracene derivative in an electronic transportation layer as an electron injection transportability compound. The compound of the above-mentioned formula (A) is desirable as a phenyl anthracene derivative. As the third class amine of aromatic series, the tetra-aryl benzidine derivative expressed with a formula (1) is desirable.

[0087]

[Formula 40]



[0088] It is R1 -R4 when a formula (1) is explained. An aryl group, an alkyl group, an alkoxy group, an aryloxy group, or a halogen radical is expressed, respectively, and these may be the same or may differ. When r1-r4 are the integers of 0-5, respectively and r1-r4 are two or more integers, respectively, it may join together mutually, respectively and R1 adjoining comrades, R2 comrades, R3 comrades, and R4 comrades may form a ring. R5 And R6 An alkyl group, an alkoxy group, the amino group, or a halogen radical is expressed, respectively, and these may be the same or may differ. r5 and r6 are the integers of 0-4, respectively.

[0089] R1 -R4 As an aryl group expressed, you may be the thing of a monocycle or many rings, and the condensed ring and a ring set are also included. The number of total carbon may have the desirable thing of 6-20, and you may have the substituent. As a substituent in this case, an alkyl group, an alkoxy group, an aryl group, an aryloxy group, the amino group, a halogen atom, etc. are mentioned. Specifically a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, a naphthyl group, an anthryl radical, a biphenyl radical, a phenyl anthryl radical, a tolyl anthryl radical, etc. are mentioned, especially a phenyl group is desirable, and, as for the joint location of an aryl group, especially a phenyl group, it is desirable that it is the 3rd place (it is the meta position to the joint location of N) or the 4th place (it is the para position to the joint location of N).

[0090] R1 -R4 As an alkyl group expressed, also by the shape of a straight chain, you may have branching, and the thing of carbon numbers 1-10 may be desirable, and may have the substituent. The thing same as a substituent in this case as an aryl group is mentioned. Specifically, a methyl group, an ethyl group, a propyl group (n-, i-), butyl (n-, i-, s-, t-), etc. are mentioned.

[0091] R1 -R4 As an alkoxy group expressed, the thing of the carbon numbers 1-6 of an alkyl part is desirable, and a methoxy group, an ethoxy radical, a t-butoxy radical, etc. are specifically mentioned. The alkoxy group may be permuted further.

[0092] R1 -R4 As an aryloxy group expressed, a phenoxy group, 4-methylphenoxy radical, 4-(t-butyl) phenoxy group, etc. are mentioned.

[0093] R1 -R4 A chlorine atom, a bromine atom, etc. are mentioned as a halogen radical expressed.

[0094] Also in a formula (1), as a desirable mode, either r1-r4 are two or more integers, and the case where R1 comrades, R2 comrades, R3 comrades, or R4 comrades join together mutually, and it forms a ring (for example, benzene ring) is mentioned.

[0095] Moreover, as another desirable mode, it is R1 -R4. At least one piece is the case where it is an aryl group. That is, r1-r4 are not set to 0 to coincidence. Therefore, r1+r2+r3+r4 are one or more integers, and they are a number which fulfills the conditions in which at least one aryl group exists.

[0096] R1 -R4 As for at least one piece, it is desirable that 2-4 aryl groups exist in 1 molecule as R1 -R4 especially when it is an aryl group, and it is desirable that 2-4 in r1-r4 are one or more integers. Especially an aryl group is R1 -R4 which it exists with 2-4 grand totals in a molecule, 2-4 in r1-r4 are 1 preferably, and r1-r4 are 1 still more preferably, and is contained. It is desirable that all are also aryl groups. Namely, R1 -R4 in a molecule Although you may combine with a different thing even if 2-4 aryl groups existed in the four benzene rings which may be permuted with the grand total and it has combined 2-4 aryl groups with the same thing in the four benzene rings, it is desirable to have combined with the benzene ring from which 2-4 aryl groups differ especially, respectively. And it is more desirable that at least two aryl groups have combined with the para position or the meta position to the joint

location of N further. Moreover, it is desirable that at least one piece is a phenyl group as an aryl group in this case, namely, it is desirable for an aryl group and the benzene ring to become together and to form 4- or 3-biphenyl radical to N atom. It is especially desirable that 2-4 pieces are 4- or 3-biphenyl radical. As for 4- or 3-biphenyl radical, one side both may be intermingled. Moreover, especially (1-, 2-) as aryl groups other than a phenyl group, a naphthyl group, an anthryl (1-, 2-, 9-) radical, a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, etc. are desirable, and it is desirable to also combine aryl groups other than a phenyl group with the para position or the meta position to the joint location of N. These aryl groups may also be intermingled with the phenyl group.

[0097] It sets at a ceremony (1) and is R5 and R6. As the alkyl group and alkoxy group which are expressed, and a halogen atom, it is R1 -R4. What was mentioned by the way, and the same thing are mentioned.

[0098] R5 and R6 As an amino group expressed Although it has a substituent also in no permuting, what has a substituent is desirable. Specifically A dimethylamino radical, a diethylamino radical, a diphenylamino radical, A ditolylamino radical, the JIBIFENIRIRU amino group, an N-phenyl-N-tolylamino radical, The N-phenyl-N-naphthyl amino group, the N-phenyl-N-biphenyl amino group, the N-phenyl-N-anthryl amino group, the N-phenyl-N-pyrenyl amino group, a dinaphthylamino radical, a JIAN tolylamino radical, the JIPIRE nil amino group, etc. are mentioned.

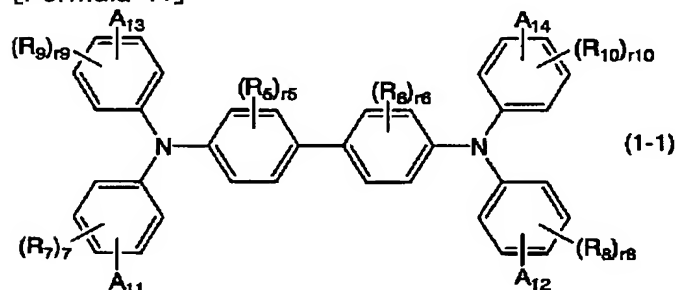
[0099] As for both r5 and r6, it is desirable that it is 0, and the biphenylene radical which connects two arylamino radicals has a desirable non-permuted thing.

[0100] in addition, the time of r1-r4 being two or more integers -- each R -- 1 -R4 comrades -- each -- it may be the same or you may differ. Moreover, it is R5 when r5 and r6 are two or more integers. Comrades and R6 comrades may be the same, or may differ from each other.

[0101] Also in these compounds, the compound expressed with the following type (1-1) is desirable.

[0102]

[Formula 41]



[0103] When a formula (1-1) is explained, A11-A14 express the phenyl group or hydrogen atom combined with the para position (the 4th place) or the meta position (the 3rd place) to the joint location of N, respectively, and these may be the same or may differ. However, as for two or more pieces, A11-A14, it is desirable that it is a phenyl group. These phenyl groups may have the substituent further and are R1 -R4 as a substituent in this case. The same thing as the substituent which the aryl group expressed mentioned by the way can be mentioned.

[0104] R7 -R10 express an alkyl group, an alkoxy group, an aryl group, an aryloxy group, or a halogen radical, respectively, and these may be the same or may differ. As these examples, it is R1 -R4 of a formula (1). What was mentioned by the way, and the same thing can be mentioned.

[0105] r7-r10 are the integers of 0-4, respectively, and, as for r7-r10, it is desirable that it is 0.

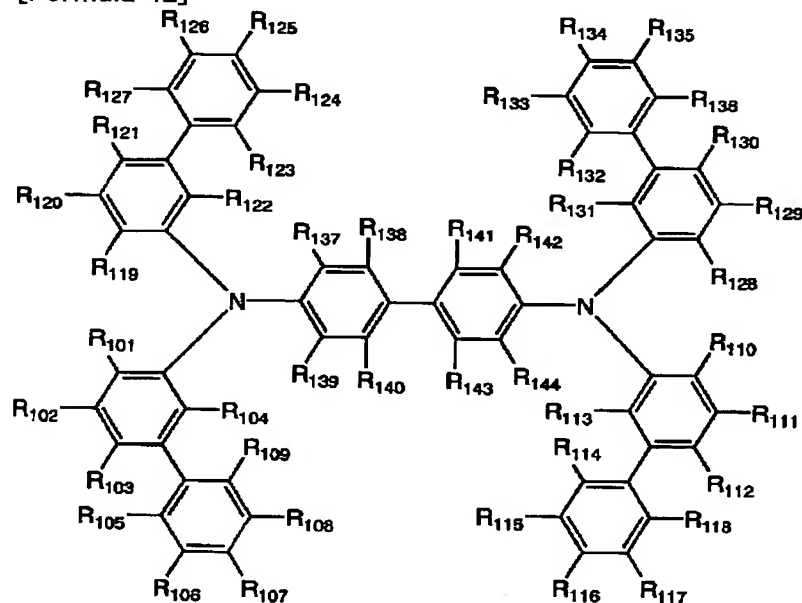
[0106] in addition, the time of r7-r10 being two or more each integers -- every -- R7 - R10 comrades may be the same, or may differ.

[0107] Moreover, in a formula (1-1), R5, R6, and r5 and r6 are synonymous with the thing of a formula (1), and it is desirable that it is r5=r6=0.

[0108] Although the example of a compound expressed with a formula (1) is shown below, this invention is not limited to this. The example is shown according to the display of a formula (I) and (II), and only the substituent is shown, when H shows at the time of H and a substituent exists altogether in R1 - R4 grade. In addition, N of use, N'-JI (1-naphthyl)-N, and an N'-diphenyl benzidine can be illustrated in the example.

[0109]

[Formula 42]



(I)

[0110]

[Formula 43]

1243					
$R_{119} \sim R_{132}$	$R_{123} \sim R_{127}$	$R_{128} \sim R_{131}$	$R_{132} \sim R_{138}$	$R_{137} \sim R_{144}$	
H	H	H	H	H	H
H	$R_{128} = CH_3$	H	$R_{135} = CH_3$	H	H
H	$R_{125} = CH_3$	H	$R_{134} = CH_3$	H	H
H	$R_{125} = Ph$	H	$R_{134} = Ph$	H	H
H	$R_{125} = OPh$	H	$R_{134} = OPh$	H	H
H	$R_{125} = N(C_2H_5)_2$	H	$R_{134} = N(C_2H_5)_2$	H	H
$R_{120} = Ph$	H	$R_{139} = Ph$	H	H	$R_{137} = R_{142} = CH_3$
$R_{120} = OPh$	H	$R_{139} = OPh$	H	H	$R_{140} = R_{143} = CH_3$
H	H	H	H	H	H
H	H	H	H	H	H
$R_{120} = Ph$	$R_{126} = Ph$	$R_{129} = Ph$	$R_{134} = Ph$	H	H
H	$R_{126} = CH_3$	H	$R_{134} = CH_3$	H	H
H	$R_{126} = Ph$	H	$R_{135} = Ph$	H	H

化合物 No.	Ar ₁₀₄	Ar ₁₀₅	R ²⁰¹ ~R ²
105-1			H
105-2			H
105-3			H
105-4			H
105-5			H
105-6			H
105-7			H
105-8			H

[0113]

[Formula 46]

Ar ₁₀₄	Ar ₁₀₅	R ²⁰¹ ~R ²⁰⁴	R ²⁰⁵ ~R ²⁰⁸	R ²⁰⁹ ~R ²¹³	R ²¹⁴ ~R ²¹⁸	R ¹³⁷ ~R ¹⁴⁴
		H	H	H	H	H
		H	H	H	H	H
		H	H	H	H	H
		H	H	H	H	H
		H	H	H	H	H

化合物 No.	
105-9	
105-10	
105-11	
105-12	
105-13	

[0114]

[Formula 47]

化合物 No.	Ar ₁₀₄	Ar ₁₀₅	R ²⁰¹ ~R ²⁰⁴	R ²⁰⁵ ~R ²⁰⁸	R ²⁰⁹ ~R ²¹³	R ²¹⁴ ~R ²¹⁸	R ¹³⁷ ~R ¹⁴⁴
105-14			H	H	H	H	H
105-15			H	H	H	H	R ¹³⁷ =R ¹⁴² =CH ₃
105-16			H	H	H	H	R ¹³⁷ =R ¹⁴² =CH ₃
105-17			H	H	R ²¹¹ =Ph	R ²¹⁶ =Ph	H
105-18			H	H	R ²¹² =Ph	R ²¹⁷ =Ph	H
105-19			H	H	R ²¹³ =Ph	R ²¹⁸ =Ph	H

[0115] One sort of tetra-aryl benzidine derivatives expressed with a formula (1) may be used, or may be used together two or more sorts.

[0116] It is desirable still more desirable that an electron injection transportability compound / hole impregnation transportability compound is 10 / 90 – 90/10, and the mixing ratios (volume ratio) of the electron injection transportability compound and hole impregnation transportability compound in a mixolimnion are 20 / 80 – 80/20.

[0117] In such a mixolimnion, when using the above-mentioned phenyl anthracene derivative

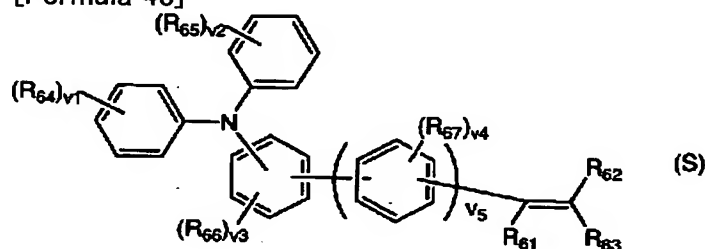
for an electronic transportability compound, this self can be used as a blue luminescence compound. Thus, when using a phenyl anthracene derivative as a blue luminescence compound, mixing with a tetra-aryl benzidine derivative and considering as a blue luminous layer, as for a phenyl anthracene derivative / tetra-aryl benzidine derivative (volume ratio), 95 / 5 - 30/70 are desirable, and 90 / 10 - 40/60 are more desirable.

[0118] Moreover, in the above mixolimnions, a dopant may be doped further and the dope of a dopant is desirable in respect of the improvement in luminous efficiency, and the stability of a component. As for the amount of the dopant used, it is desirable in a mixolimnion that it is 0.1 to 20 mass %.

[0119] As such a dopant, the above-mentioned styryl system amine compound is used preferably. The compound expressed especially with a formula (S) is desirable.

[0120]

[Formula 48]



[0121] When a formula (S) is explained, R61 expresses hydrogen or an aryl group among a formula (S). As an aryl group expressed with R61, you may have a substituent, and a thing with 6-30 total carbon is desirable, for example, a phenyl group etc. is mentioned.

[0122] R62 and R63 express hydrogen, an aryl group, or an alkenyl radical respectively, and these may be the same or may differ.

[0123] As an aryl group expressed with R62 and R63, you may have a substituent, and a thing with 6-70 total carbon is desirable. A phenyl group, a naphthyl group, an anthryl radical, etc. are specifically mentioned, and an arylamino radical (for example, diphenylamino radical), an arylamino aryl group, etc. are desirable as a substituent. moreover, the radicals of the monovalence guided from the compound in which it is also desirable that a styryl radical (the styryl radical may have substituents, such as a phenyl group, a diphenylamino radical, a naphthyl (phenyl) amino group, and a diphenyl aminophenyl radical, further.) is contained in such a substituent, and it is shown by the formula (S) in such a case — itself — or it is desirable that it is also the structure which was combined through the connection radical.

[0124] You may be what has a substituent as an alkenyl radical expressed with R62 and R63. A thing with 2-50 total carbon is desirable, and it is desirable for a vinyl group etc. to be mentioned and to form the styryl radical with the vinyl group. The styryl radical may have substituents, such as an arylamino aryl group (for example, diphenyl aminophenyl radical) and an arylamino radical (for example, diphenylamino radical). In such a case, it is desirable that it is also the structure which the radicals of the monovalence guided from the compound shown by the formula (S) are itself, or they combined through the connection radical.

[0125] the radicals of the monovalence same and guided [R64 and R65 may express an arylamino radical or an arylamino aryl group, and may contain the styryl radical (the styryl radical may have substituents, such as a phenyl group, further.) in these, and] from the compound shown by the formula (S) in such a case, — itself — or it is desirable that it is also the structure which was combined through the connection radical.

[0126] v1 and v2 express the integer of 0-5, and when v1 and v2 are two or more, R64 comrades and R65 comrades may join together mutually, and they may form the condensed rings, such as the benzene ring.

[0127] R66 and R67 express an alkyl group and an aryl group respectively. As an alkyl group expressed with R66 and R67, also by the shape of a straight chain, you may have the substituent, and you may have branching, and a thing with 1-6 total carbon is desirable, and a methyl group, an ethyl group, etc. are specifically mentioned. As an aryl group expressed with

R66 and R67, you may have the substituent, and monocycles may also be many rings, a thing with 6–20 total carbon is desirable, and a phenyl group etc. is specifically mentioned.

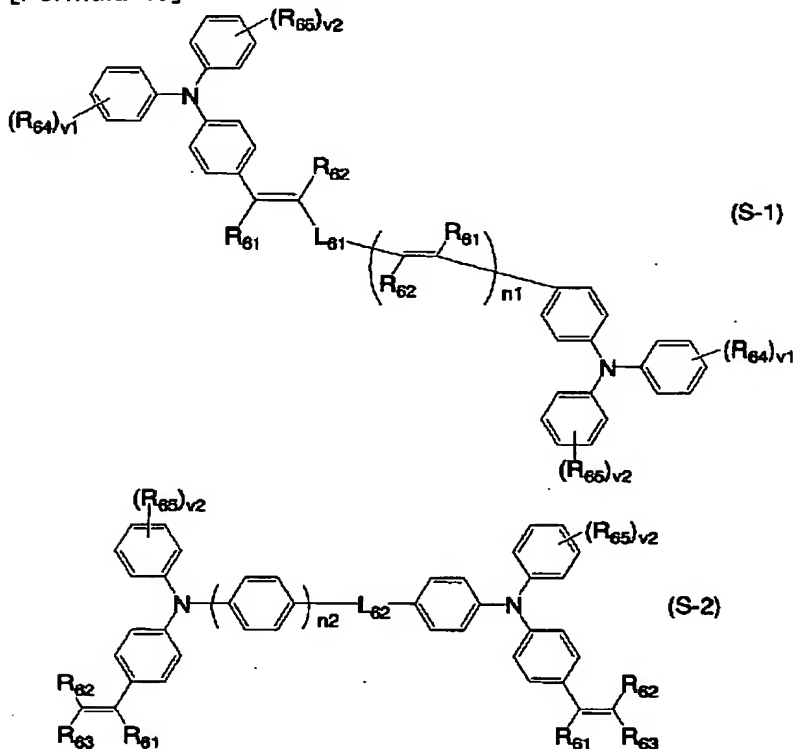
[0128] v3 and v4 express the integer of 0–4.

[0129] v5 expresses 0 or 1. The structure combined so that the diphenylamino radical which v5 is 0 and R64 and R65 may combine, and the vinyl group which R61, R62, and R63 combined might serve as the para position to a phenylene group also in a formula (S) is desirable.

[0130] The compound especially expressed with the following type (S-1) and (S-2) is desirable.

[0131]

[Formula 49]



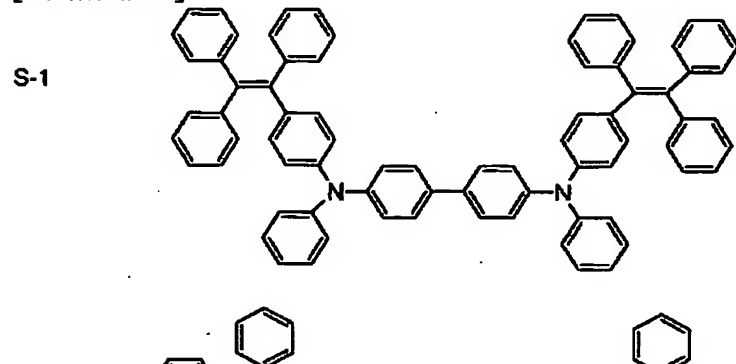
[0132] R61, R62, R64, R65, v1, and v2 are a thing in a formula (S), and the thing of homonymy among a formula (S-1), n1 expresses 0 or 1 and L61 expresses a joint hand or an arylene radical. As a desirable example of an arylene radical, a phenylene group, a biphenylene radical, a naphthylene radical, anthrylene group, etc. are mentioned, and these combination may also be desirable and, as for these radicals, you may have the substituent further.

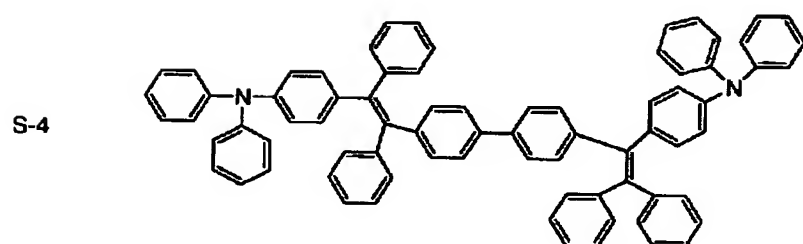
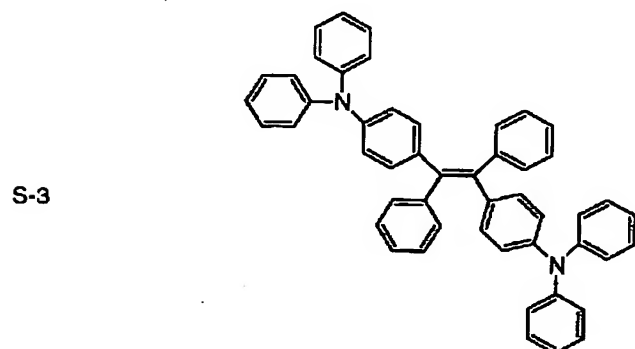
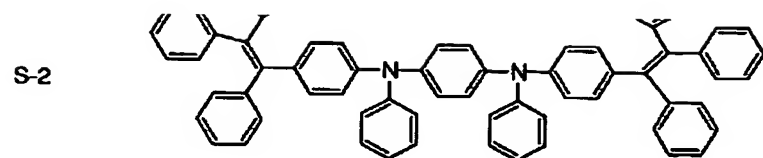
[0133] R61–R63, and R65 and v2 are a thing in a formula (S), and the thing of homonymy among a formula (S-2), and n2 expresses 0 or 1 and L62 is synonymous with L61 in a formula (S-1).

[0134] The example of the styryl system amine compound of a formula (S) is shown below.

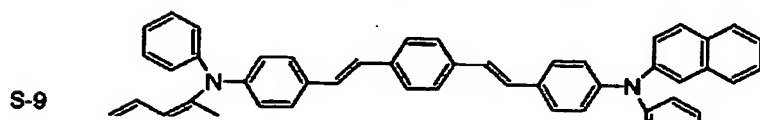
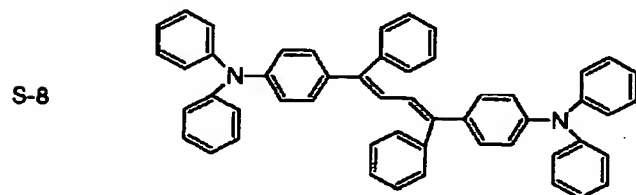
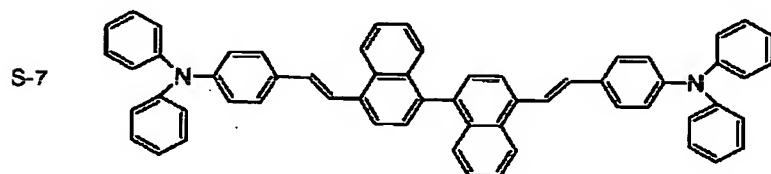
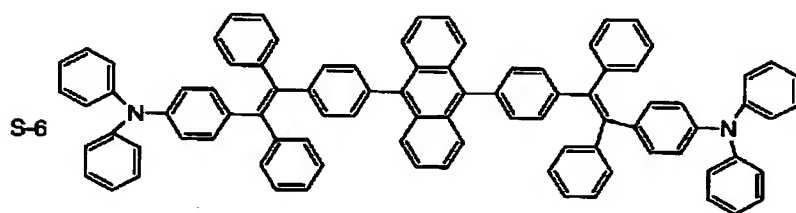
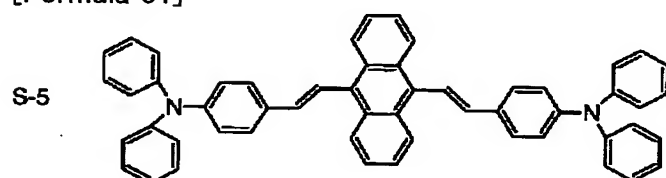
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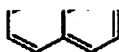
[Formula 50]





[0136]
[Formula 51]





[0137] One sort of these compounds may be used or they may be used together two or more sorts.

[0138] In the above mixolimnions, it is desirable to choose an electron injection transportability compound and a hole impregnation transportability compound so that the product of whenever [charge transfer] and the density of electric charge may become almost equal. The still more desirable aforementioned conditions are fulfilled and it is desirable that also whenever [charge transfer] is almost equal. In this case, as for whenever [charge transfer], it is desirable that it asks by the time OBUFU light method etc., and is in the range of $1 \times 10^{-1} - 1 \times 10^{-5} \text{ cm}^2/\text{V}\cdot\text{s}$. Thus, as whenever [charge transfer] becomes near, ***** of a carrier decreases from that raising the recombination probability of i carrier by choosing a compound raises luminous efficiency, and ii luminous layer, the damage of a carrier transportation layer becomes small, and there is an advantage which can carry out reinforcement of the luminescence life of a component. Moreover, by mixing a hole impregnation transportability compound and an electron injection transportability compound, the mobility of each electron and a hole falls and there is also an advantage of recombination probability improving.

[0139] You may be mixing to homogeneity and an electron injection transportability compound and a hole impregnation transportability compound have concentration distribution in the direction of thickness, its concentration of a hole impregnation transportability compound is high at a hole transportation layer side, the concentration dwindles it toward an electronic transportation layer side, on the other hand, the concentration of an electron injection transportability compound is high at an electronic transportation layer side, and they are good in a mixolimnion also as inclination film which the concentration dwindles toward a hole transportation layer side. In the inclination film, an electron injection transportability compound has the desirable thing of the electron injection transportability compound which exists in 1/2 field of the mixolimnion by the side of an electronic transportation layer at the whole mixolimnion for which 95-50 mass % extent existence is recognized, and it is desirable that the same relation is materialized also about a hole impregnation transportability compound.

[0140] The electron and the hole are distributed over the whole luminous layer, the recombination point and the luminescence point have spread in [whole] the luminous layer, and the blue luminous layer which consists of the above mixolimnions is emitting light not only near the interface between layers, but by the whole mixolimnion. This can be easily checked by fitting [the emission spectrum of an observation, and the emission spectrum which assumed the luminescence field and performed optical interference simulation of the reflected light in each optical interface, and direct light]. Thus, since it is possible to emit light in the whole layer, luminescence from which several sorts of wavelength which carried out the laminating differs can be taken out from one component to stability, and an advantage, such as prolonging the luminescence life of a component, is acquired.

[0141] The luminescence maximum wave length of the blue luminous layer in this invention is 400-500nm.

[0142] As for the thickness of the above mixolimnions, it is desirable that they are 1-500nm and further 20-200nm.

[0143] As for the organic EL device of <other luminescent color> this invention, it is desirable to deal with multicolor luminescence which has the luminous layer of at least one layer in which luminescence wavelength differs from this other than a blue luminous layer. Such luminous layers may be red (600-700nm of luminescence maximum wave length), and a thing which emits luminescence light, such as being green (500-560nm of luminescence maximum wave length).

[0144] Moreover, in these luminous layers, it is desirable to consider as the mixolimnion using the same host ingredient as a blue luminous layer, and to consider as the luminous layer which emits the luminescence light of a different color from blue by adding a dopant. Thereby,

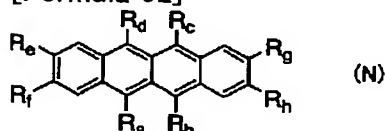
a recombination field will become desirable on generation of breadth and an exciton.

[0145] For example, there is a mixolimnion which carried out the dopant to the mixture of the aforementioned phenyl anthracene derivative and a tetra-aryl benzidine derivative as one desirable mode of such a mixolimnion, and doped the naphthacene derivative. For example, when rubrene is used as a naphthacene derivative, red (540–600nm of luminescence maximum wave length) luminescence is attained. Addition of a naphthacene derivative is desirable from a viewpoint of the reinforcement of a component. In addition, an advantage with the same said of a pentacene derivative is acquired. These are indicated by JP,8-311442,A, WO 98/No. 08360, Japanese Patent Application No. No. 137505 [ten to], etc.

[0146] The compound expressed with a formula (N) as a naphthacene derivative is desirable.

[0147]

[Formula 52]



[0148] In a formula (N), Ra, Rb, Rc, and Rd express either the alkyl group which has unsubstituted or a substituent, an aryl group, the amino group, a heterocycle radical and an alkenyl radical, respectively, and it is desirable that they are either an aryl group, the amino group, a heterocycle radical and an alkenyl radical.

[0149] As an aryl group expressed with Ra, Rb, Rc, and Rd, you may be the thing of a monocycle or many rings, and the condensed ring and a ring set are also included. The number of total carbon may have the desirable thing of 6–30, and you may have the substituent.

[0150] As an aryl group expressed with Ra, Rb, Rc, and Rd, they are a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, a naphthyl group (1-, 2-), an anthryl radical, a biphenyl (o-, m-, p-) radical, a terphenyl radical, a phenan tolyl group, etc. preferably.

[0151] As an amino group expressed with Ra, Rb, Rc, and Rd, any are sufficient as an alkylamino radical, an arylamino radical, the aralkyl amino group, etc. As for these, it is desirable to have aliphatic series with 1–6 total carbon and/or the aromatic series ring of one to 4 ring. Specifically, a dimethylamino radical, a diethylamino radical, a dibutylamino radical, a diphenylamino radical, a ditolylamino radical, the bis-JIFENIRIRU amino group, the bis-naphthyl amino group, etc. are mentioned.

[0152] As a heterocycle radical expressed with Ra, Rb, Rc, and Rd, 5 members which contain O, N, and S as a hetero atom or the aromatic series heterocycle radical of six membered-rings, the condensation polycyclic aroma heterocycle radical of carbon numbers 2–20, etc. are mentioned. As an aromatic series heterocycle radical and a condensation polycyclic aroma heterocycle radical, a thienyl group, a furil radical, a pyrrolyl radical, a pyridyl radical, a quinolyl radical, a quinoxalyl radical, etc. are mentioned, for example.

[0153] You may be an unsubstituted thing although the phenyl alkenyl radical which has a phenyl group in one of the substituents at least (1- and 2-), a diphenyl (1, 2- and 2, and 2-) alkenyl radical, a triphenyl (1, 2, and 2-) alkenyl radical, etc. are desirable as an alkenyl radical expressed with Ra, Rb, Rc, and Rd.

[0154] When Ra, Rb, Rc, and Rd have a substituent, it is desirable that at least two of these substituents are either an aryl group, the amino group, a heterocycle radical, an alkenyl radical and an aryloxy radical. About an aryl group, the amino group, a heterocycle radical, and an alkenyl radical, it is the same as that of Above Ra, Rb, Rc, and Rd.

[0155] As an aryloxy radical used as the substituent of Ra, Rb, Rc, and Rd, what has an aryl group with 6–18 total carbon is desirable, and a phenoxy group (o-, m-, p-) etc. is specifically mentioned.

[0156] Two or more sorts of these substituents may form the condensed ring. Furthermore, you may permute and it is the same as that of the above as a desirable substituent in that

case.

[0157] When Ra, Rb, Rc, and Rd have a substituent, it is desirable that the two or more sorts have the above-mentioned substituent at least. It may not be limited especially as the permutation location, and any of meta, Para, and the ortho position are sufficient. Moreover, although it is desirable respectively that it is the same as for Ra, and Rd, Rb and Rc, you may differ.

[0158] Re, Rf, Rg, and Rh express either the alkyl group which may have hydrogen or a substituent, respectively, an aryl group, the amino group and an alkenyl radical.







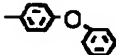
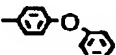


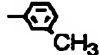





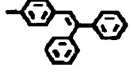
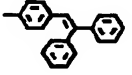

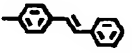




[0159] You may have branching, even if the thing of 1-6 has a desirable carbon number and it is a straight chain-like as an alkyl group expressed with Re, Rf, Rg, and Rh. As a desirable example of an alkyl group, a methyl group, an ethyl group, (n, i)-propyl group, (n, i, sec, tert)-butyl, a (n, i, neo, tert)-pentyl radical, etc. are mentioned.

[0160] As the aryl group expressed with Re, Rf, Rg, and Rh, the amino group, and an alkenyl radical, it is the same as that of the case of Above Ra, Rb, Rc, and Rd. Moreover, although it is desirable that it is the same respectively as for Re, and Rf, Rg and Rh, they may differ.

[0161] The example of a naphthacene derivative is shown below. The combination of a display of a formula (N) shows the example.








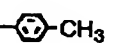




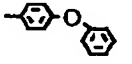
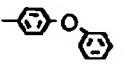


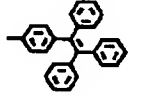
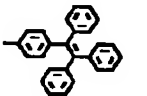
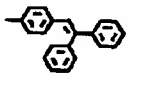
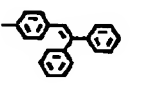
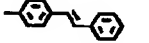
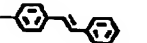








[0162]

[Formula 53]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
1	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2		-H	-H		-H	-H	-H	-H
3		-H	-H		-H	-H	-H	-H
4		-H	-H		-H	-H	-H	-H
5		-H	-H		-H	-H	-H	-H
6		-H	-H		-H	-H	-H	-H
7		-H	-H		-H	-H	-H	-H
8		-H	-H		-H	-H	-H	-H
9		-H	-H		-H	-H	-H	-H
10		-H	-H		-H	-H	-H	-H
11		-H	-H		-H	-H	-H	-H
12		-CH ₃	-CH ₃		-CH ₃	-CH ₃	-CH ₃	-CH ₃
13		-H	-H		-CH ₃	-CH ₃	-CH ₃	-CH ₃

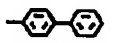




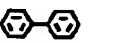

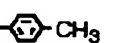

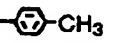
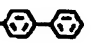
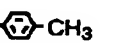
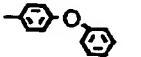
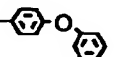
[0163]

[Formula 54]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
14	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H
15		-Ph		-Ph	-H	-H	-H	-H
16					-H	-H	-H	-H
17		-Ph		-Ph	-H	-H	-H	-H
18					-H	-H	-H	-H
19		-Ph		-Ph	-H	-H	-H	-H
20		-Ph	-Ph		-H	-H	-H	-H
21		-Ph		-Ph	-H	-H	-H	-H
22		-Ph		-Ph	-H	-H	-H	-H
23		-Ph		-Ph	-H	-H	-H	-H
24					-H	-H	-H	-H
25					-H	-H	-H	-H

[0164]

[Formula 55]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
26	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-H	-H
27		-Ph		-Ph	-Ph	-Ph	-H	-H
28					-Ph	-Ph	-H	-H
29		-Ph		-Ph	-Ph	-Ph	-H	-H
30					-Ph	-Ph	-H	-H
31		-Ph		-Ph	-Ph	-Ph	-H	-H

32		-Ph	-Ph		-Ph	-Ph	-H	-H
33		-Ph		-Ph	-Ph	-Ph	-H	-H
34		-Ph		-Ph	-Ph	-Ph	-H	-H
35		-Ph		-Ph	-Ph	-Ph	-H	-H
36					-Ph	-Ph	-H	-H
37					-Ph	-Ph	-H	-H

[0165]

[Formula 56]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
38	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph
39		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
40					-Ph	-Ph	-Ph	-Ph
41	-CH ₃	-Ph	-CH ₃	-Ph	-Ph	-Ph	-Ph	-Ph
42		-CH ₃		-CH ₃	-Ph	-Ph	-Ph	-Ph
43	-O-	-Ph	-O-	-Ph	-Ph	-Ph	-Ph	-Ph
44		-Ph	-Ph		-Ph	-Ph	-Ph	-Ph
45		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
46		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
47		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
48					-Ph	-Ph	-Ph	-Ph
49					-Ph	-Ph	-Ph	-Ph

[0166] One sort of these compounds may be used or they may be used two or more sorts.

[0167] As for the amount of the naphthacene derivative used in a mixolimnion, it is desirable that it is 0.1 to 20 mass %.

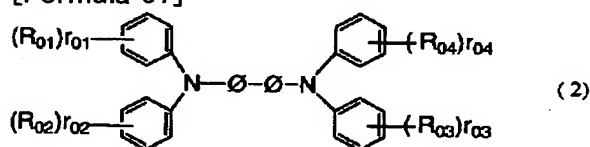
[0168] Moreover, as for the mixing ratio of the phenyl anthracene derivative and tetra-aryl benzidine derivative in such a mixolimnion, it is desirable that the volume ratios of a phenyl anthracene derivative / tetra-aryl benzidine derivative are 90 / 10 – 10/90. As for the thickness, it is desirable that they are 1–500nm and further 10–200nm.

[0169] Including a blue luminous layer, two-layer or the luminous layer of three layers can be prepared, and a component which carries out white luminescence can consist of this inventions.

[0170] Although the part was described above in <hole transportation and/or impregnation layer> this invention, it is desirable to prepare hole transportation and/or an impregnation layer. It is desirable to prepare a hole transportation layer, and to prepare hole transportation and/or an impregnation layer (for it to be called a hole impregnation transportation layer), when it is the last mode which would use the hole impregnation transportability compound in the layer as a host ingredient of a luminous layer. It is desirable to use the third class amine of aromatic series as a hole impregnation transportability compound in this case, and the triphenylamine derivative expressed with the tetra-aryl benzidine derivative and formula (2) which are expressed with a formula (1) is desirable. It is as [formula / (1)] above-mentioned. A formula (2) is explained.

[0171]

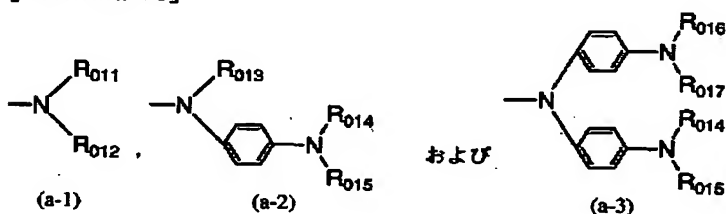
[Formula 57]



[0172] In a formula (2), two phi expresses a phenylene group. as the biphenylene radical of phi-phi — 4 and 4 — a — biphenylene radical, and — biphenylene radical, 3, and 3 '3, 4'— biphenylene radical, and '2, 2' — although you may be any of a — biphenylene radical, and — biphenylene radical, 2, and 3 '2, 4'—biphenylene radical — especially — 4 and 4' — biphenylene radical is desirable.

[0173] Moreover, R01, R02, R03, and R04 are an alkyl group, an aryl group, a diaryl amino aryl group, and [0174], respectively.

[Formula 58]



(ここで、R011、R012、R013、R014、R015、R016およびR017は、それぞれ、アリール基を表す。)

[0175] It expresses whether it is *****, and these may be the same or may differ. However, at least one of R01—the R04 expresses a diaryl amino aryl group or the above (a-1) of — (a-3), and either. The aryl group expressed with R011, R012, R013, R014, R015, R016, and R017 could be permuted, or may have a substituent, respectively.

[0176] The alkyl group expressed with R01, R02, R03, and R04 may have the substituent, also by the shape of a straight chain, you may have branching, and a thing with 1–20 total carbon is desirable, and a methyl group, an ethyl group, etc. are specifically mentioned.

[0177] As an aryl group expressed with R01, R02, R03, R04, R011, R012, R013, R014, R015, R016, and R017 You may be the thing of a monocycle or many rings, and a thing with 6–20 total carbon is desirable, and, specifically, phenyl group, naphthyl group, anthryl radical,

phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned. These aryl groups may be permuted further and the aryl group or alkoxy group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6, an aryloxy radical, and -N(R021) R022 grade are mentioned as such a substituent. Here, R021 and R022 express the aryl group which has no permuting or a substituent, respectively.

[0178] As an aryl group expressed with R021 and R022, you may be the thing of a monocycle or many rings, and a thing with 6-20 total carbon is desirable, phenyl group, naphthyl group, anthryl radical, phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned, and, specifically, a phenyl group is mentioned especially preferably. These aryl groups may be permuted further and the aryl group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6 is mentioned as such a substituent. A methyl group is mentioned preferably as said alkyl group, and a phenyl group is mentioned preferably as said aryl group.

[0179] Moreover, the diaryl amino aryl group expressed with R01, R02, R03, and R04 is for example, a diaryl aminophenyl radical, and what the diaryl amino group has combined with the meta position (the 3rd place) or the para position (the 4th place) to the frame expressed with a formula (2) in such a radical is desirable. Although the phenyl group at this time may have the substituent further, it is desirable to have only a diaryl amino group.

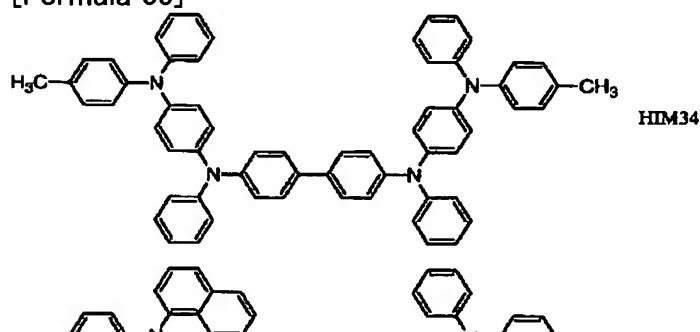
[0180] As an aryl group in the diaryl amino group, you may be the thing of a monocycle or many rings, and a thing with 6-20 total carbon is desirable, phenyl group, naphthyl group, anthryl radical, phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned, and, specifically, a phenyl group is mentioned especially preferably. These aryl groups may be permuted further and the aryl group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6 is mentioned as such a substituent. A methyl group is mentioned preferably as said alkyl group, and a phenyl group is mentioned preferably as said aryl group. Moreover, as a substituent of an aryl group, the above-mentioned radicals other than the diaryl amino aryl group expressed with R01-R04 in a formula (2) are also desirable. When it has a substituent two or more, even if they are the same, they may differ. Moreover, as for a substituent, it is desirable to have combined with the meta position or the para position to the joint location of N.

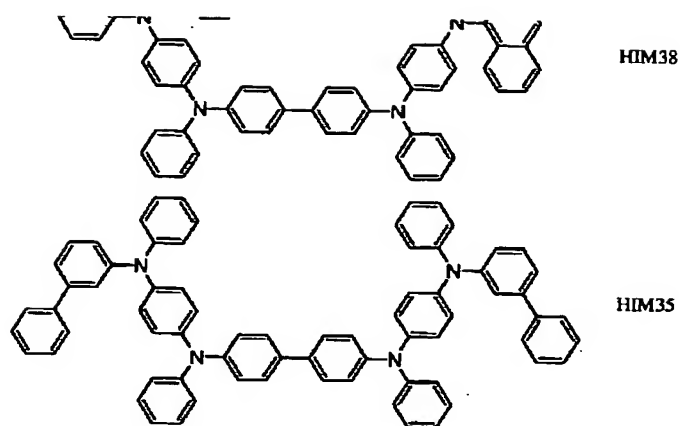
[0181] Moreover, in a formula (2), respectively, as for r01, r02, r03, and r04, it is desirable, although the integer of 0-2 is expressed preferably 0-5, and that it is especially 0 or 1. And as for especially r01+r02+r03+r04, to 1-4, and a pan, 2-4 are [one or more] desirable. Said R01, R02, R03, and R04 It combines with the meta position or the para position to the joint location of N. The meta position and all of R01, R02, R03, and R04 The para position, [all of R01, R02, R03, and R04] Or these may be intermingled even if R01, R02, R03, and R04 have combined with the meta position or the para position. When r01, r02, r03, or r04 are two or more, even if R01 comrades, R02 comrades, R03 comrades, or R04 comrades is the same, they may differ, and further, these adjoining things may join together mutually and they may form a ring. Such a ring may be a ring of aromatic series, such as the benzene ring, or may be a ring of aliphatic series, such as a cyclohexane ring.

[0182] Although the desirable example of a formula (2) is shown below, it is not limited to this.

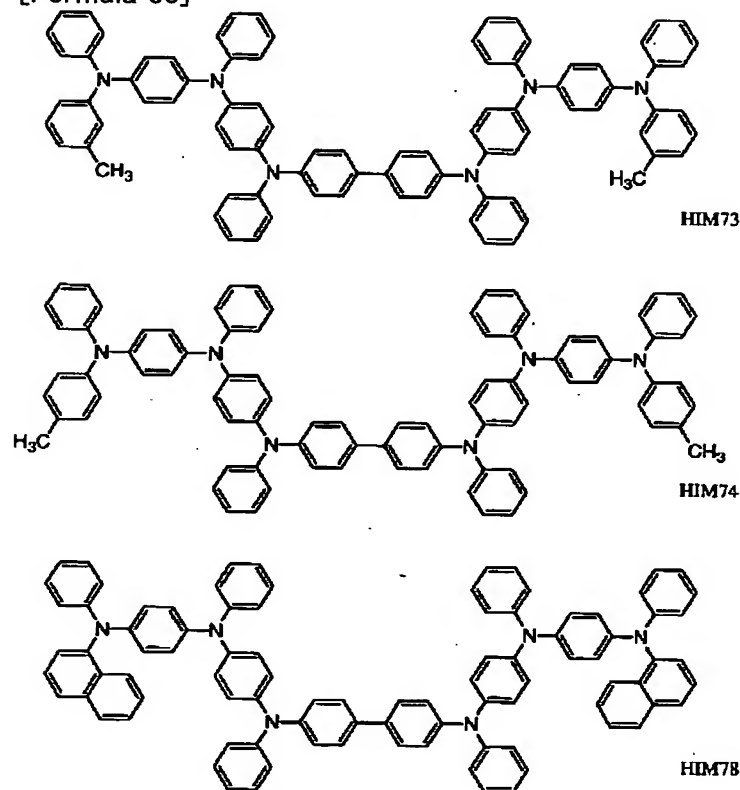
[0183]

[Formula 59]





[0184]
[Formula 60]



[0185] One sort of these may be used or may be used together two or more sorts.

[0186] It is desirable to use the compound of a formula (1) for a hole transportation layer, and to use the compound of a formula (2) for a hole impregnation layer from a luminous layer side, when preparing a hole transportation layer and a hole impregnation layer in order. The function which blocks an electron improves by combining such a compound. Anyway, it is desirable to use the third class amine of aromatic series which has a benzidine frame in a hole transportation layer, and does not have a phenylenediamine frame, and it is desirable to use the third class amine of aromatic series which has a phenylenediamine frame in a hole impregnation layer.

[0187] The thickness of a hole impregnation layer has 1–1000nm and desirable further 1–100nm, and the thickness of a hole transportation layer has 1–200nm and desirable further 5–100nm. When preparing one layer of these layers, it is desirable to consider as the thickness of 1–1000nm and further 10–500nm.

[0188] Although the part was described above in <electronic transportation and/or

impregnation layer> this invention, it is desirable to prepare electronic transportation and/or an impregnation layer. It is desirable to prepare an electronic transportation layer, and to prepare electronic transportation and/or an impregnation layer (for it to be called an electron injection transportation layer), when it is the last mode which would use the electron injection transportability compound in the layer as a host ingredient of a luminous layer. Quinoline derivatives, such as an organometallic complex which makes a ligand eight quinolinols, such as tris (8-quinolinolato) aluminum (AIQ3) besides the aforementioned phenyl anthracene derivative, thru/or the derivative of those as an electron injection transportability compound in this case, an OKISA diazole derivative, a perylene derivative, a pyridine derivative, a pyrimidine derivative, a quinoxaline derivative, a diphenyl quinone derivative, a nitration fluorene derivative, etc. can be used.

[0189] It is also desirable to use the former for the electronic transportation layer by the side of a luminous layer, and to use the latter for the electron injection layer by the side of cathode using the aluminum complex (especially tris (8-quinolinolato) aluminum) which makes a ligand especially the diphenyl ANTORAN derivative of a formula (A), an eight quinolinol, or its derivative. In addition, it is indicated by WO 98/No. 08360 etc. about the aluminum complex which makes an eight quinolinol thru/or its derivative a ligand.

[0190] The thickness of an electron injection layer has 1-1000nm and desirable further 1-100nm, and the thickness of an electronic transportation layer has 1-500nm and desirable further 1-100nm. When preparing one layer of these layers, it is desirable to consider as the thickness of 1-1000nm and further 1-100nm.

[0191] It is desirable to use the halogenide of alkali metal (Li, Na, K, Rb, Cs, etc.) and an oxide for the cathode material used in <cathode> this invention. Specifically Lithium fluoride (LiF), a lithium chloride (LiCl), A lithium bromide (LiBr), a lithium iodide (LiI), a sodium fluoride (NaF), A sodium chloride (NaCl), a sodium bromide (NaBr), a sodium iodide (NaI), Rubidium fluoride (RbF), a rubidium chloride (RbCl), a rubidium bromide (RbBr), Oxides, such as a halogenide of an iodation rubidium (RbI), cesium fluoride (CsF), a cesium chloride (CsCl), a cesium bromide (CsBr), and a cesium iodide (CsI), and lithium oxide (Li₂O), sodium oxide (Na₂O), are mentioned. Halogenides, such as Rb and Cs, a division chloride, and an iodide are especially desirable.

[0192] The halogenide of alkali metal and an oxide may be used as a lower layer, and a laminating may be carried out with an ingredient with a still smaller work function (for example, Li, Na, K, Mg, aluminum, Ag, In, or the alloy containing these one or more sorts). As for cathode, it is desirable that crystal grain is fine, and it is desirable that it is especially in an amorphous condition. As for the sum total thickness of cathode, it is desirable to be referred to as about 10-1000nm. The lower layer thickness in the configuration using a lower layer is about 0.1-1nm.

[0193] Especially with the component which has a blue luminous layer, it is effective to use the halogenide of alkali metal and an oxide as a cathode material, and it is stabilized and can obtain blue luminescence light. Since a host's energy gap is large compared with a green system by the blue luminescence system, more efficient electron injection nature and hole impregnation nature are required. Electron injection effectiveness is bad and an alkali-metal system is effective as an efficient ingredient which changes to this in cathode like the conventional MgAg. It is because the work function is small. Moreover, about the gestalt of a halogenide and an oxide, very much, reduction etc. takes place and a work function can become a metal, when it does not change or electric field are built. Therefore, handling is the optimal as an easy electron injection ingredient. Moreover, there is effectiveness [electrode / the organic film and] of the improvement in adhesion.

[0194] Especially the thing for which the halogenide of alkali metal and an oxide are used as a cathode material is indispensable in the mode which uses neither the electron injection transportability compound of an electronic transportation layer or a hole transportation layer used as the adjacent layer, nor a hole impregnation transportability compound for a blue luminous layer as a host ingredient.

[0195] Moreover, metals, such as Li, may be doped to the organic layer of a cathode

interface.

[0196] Moreover, the closure effectiveness improves aluminum and a fluorine system compound by vacuum evaporation and carrying out a spatter at the last of electrode formation.

[0197] In addition, when using tris (8-quinolinolato) aluminum (AlQ3) etc. for electron injection and/or a transportation layer and forming cathode by the spatter, in order to prevent the damage by electron injection and/or the spatter to a transportation layer, the layer of naphthacene derivatives (above), such as rubrene, can be formed between electron injection and/or a transportation layer, and cathode at 0.1–20nm thickness.

[0198] In order to carry out field luminescence of the <anode plate> organic EL device, it is desirable transparency thru/or that one [at least] electrode determines the ingredient and thickness of an anode plate that it needs to be translucent, and the permeability of luminescence light will become 80% or more preferably since the ingredient of cathode has a limit as mentioned above. It is desirable to specifically use for an anode plate the polypyrrole which doped ITO (tin dope indium oxide), IZO (zinc dope indium oxide), SnO₂, nickel, Au, Pt and Pd, and a dopant, and especially ITOIZO is desirable. ITO is usually In 2O₃. Although SnO is contained with stoichiometric composition, some amounts of oxygen may be deflected after this. IZO is usually In 2O₃. Although ZnO is contained with stoichiometric composition, some amounts of oxygen may be deflected after this. In 2O₃ Receiving SnO₂ One to 20 mass %, and further 5 – 12 mass % of a mixing ratio are desirable. Moreover, In 2O₃ in IZO The mixing ratio of receiving ZnO is usually 12 – 32 mass % extent. Moreover, as for the thickness of an anode plate, it is desirable to be referred to as about 10–500nm. Moreover, although it is required for driver voltage to be low in order to raise the dependability of a component, ITO below 10–30ohm/**, or 10ohms / ** (usually 0.1–10ohm/**) is mentioned as a desirable thing.

[0199] Moreover, in a large device like a display, since resistance of ITO becomes large, aluminum wiring may be carried out.

[0200] Although there is especially no limit in a <substrate ingredient> substrate ingredient, in order to take out luminescence light from a substrate side, the transparency thru/or translucent ingredient of glass, resin, etc. is used. Moreover, the fluorescence conversion filter film which contains the color filter film and the fluorescence matter in a substrate, or the dielectric reflective film may be used, or the substrate itself may be colored, and the luminescent color may be controlled.

[0201] What is necessary is to adjust the property of a color filter according to the light in which an organic EL device emits light, and just to optimize ejection effectiveness and color purity, although what is necessary is just to use for the color filter film the color filter used with the liquid crystal display etc.

[0202] Moreover, if the color filter which can cut the outdoor daylight of short wavelength in which an EL element ingredient and a fluorescence conversion layer carry out light absorption is used, the contrast of the lightfastness and a display of a component will also improve.

[0203] Moreover, it is good as for instead of a color filter using an optical thin film like dielectric multilayers.

[0204] Although the fluorescence conversion filter film is absorbing the light of EL luminescence and making light emit from the fluorescent substance in the fluorescence conversion film and performs color conversion of the luminescent color, it is formed from three, a binder, a fluorescence ingredient, and a light absorption ingredient, as a presentation.

[0205] As for a fluorescence ingredient, it is [that what is necessary is just to use what has a high fluorescence quantum yield] fundamentally desirable that absorption is strong in EL luminescence wavelength region. What is necessary is in fact, for laser coloring matter etc. to be suitable and just to use a rhodamine system compound, a perylene system compound, a cyanine system compound, a phthalocyanine system compound (for a subphthalocyanine etc. to be included), a naphthalo imide system compound and a condensed-ring hydrocarbon system compound, a condensation heterocycle system compound, a styryl system compound, a coumarin system compound, etc.

[0206] As for a binder, what can perform detailed patterning in photolithography, printing, etc.

is [that what is necessary is just to choose an ingredient which does not quench fluorescence fundamentally] desirable. Moreover, an ingredient which does not receive a damage at the time of membrane formation of ITO is desirable.

[0207] When the light absorption of a fluorescence ingredient is insufficient, it uses, but when there is no need, it is not necessary to use a light absorption ingredient. A light absorption ingredient should just choose an ingredient which does not quench the fluorescence of a fluorescence ingredient.

[0208] In <luminescent color modulation using color filter> this invention, by combining an above-mentioned organic EL device and an above-mentioned color filter, the luminescent color of the above-mentioned organic EL device can be modulated, and, thereby, a multicolor luminescence organic electroluminescence display (multicolor luminescence equipment) can provide easily.

[0209] When applying the above-mentioned organic EL device to such equipment, the organic EL device which contains a luminous layer in inter-electrode [of the pair which the above-mentioned organic EL device counters mutually] is pinched, as for one [at least] electrode, it is desirable that it is a transparent electrode, but since a color filter is used, one [at least] electrode needs to be a transparent electrode, and in order to take out luminescence light from a transparent electrode side, a color filter is installed in a transparent electrode side.

[0210] Here, an organic layer shall mean the layer containing an organic compound, and a metal complex, an organometallic compound, etc. which make an organic compound a ligand shall be included in an organic compound.

[0211] Although above equipment has the display of a dot-matrix mold even if it has the display of a segmental die, it may be equipped with both display of these.

[0212] The display of a dot-matrix mold counters mutually, and has XY matrix type electrode with which two or more electrodes of a pair were arranged, and forms a pixel by making inter-electrode [for this intersection] pinch an organic layer so that it may cross. As for a color filter, it is desirable to install in the transparent electrode side of this pixel. Moreover, it is the periphery of a pixel and it is desirable to install a black matrix near the color filter installation part (usually between color filters). The leakage light between color filters can be prevented by the black matrix, and, thereby, the visibility of multicolor luminescence can be raised.

[0213] Here, with a pixel, the field of the image display array which is excited independently and can emit light is called other fields.

[0214] Two or more above-mentioned electrodes are usually stripe-like electrodes, and the electrode of a pair is arranged so that it may intersect perpendicularly mostly. In addition, since the electrode of another side is formed in many cases and the display of a dot-matrix mold is formed on manufacture using an interlayer insulation film in many cases, after a stripe-like electrode forms one electrode, Although the case where the stripe-like electrode of another side formed behind is not mostly formed on the same flat surface, the case where the stripe of the one same direction does not serve as continuation film, etc. may arise, it does not interfere, if only the amount of [which intersects perpendicularly mostly] intersection exists.

[0215] For example, there is the following approach as an approach of forming a dot-matrix mold display. 1 micrometer formed by transparence resin, such as acrylic resin and polyimide, in order to form a predetermined color filter layer on transparence substrates (glass etc.) and to raise the surface smoothness of this field preferably to the transparent electrode forming face of this color filter layer - the overcoat layer of 5mm thickness is prepared. This overcoat layer functions also as a protective layer of a color filter. Patterning of this overcoat layer is carried out, and a transparent electrode is formed on the overcoat layer which carried out patterning. In addition, between a transparent electrode layer and an overcoat layer, transparence and an electric insulation inorganic oxide layer may be prepared as a passivation layer.

[0216] To the field containing the transparent electrode layer which carried out patterning, it is 10nm - 100 micrometers. The interlayer insulation film of thickness is prepared and it is made for an insulator layer to remain in parts other than a transparent electrode formation

part. An insulator layer can be formed by resin, such as polyimide besides inorganic compounds, such as SiO₂ and SiN_x, acrylic resin, and an epoxy resin.

[0217] Furthermore, a spacer is formed on [other than an insulator layer] an insulator layer in this case, or an overhang object with still larger width of face than a spacer is formed on a spacer, and there is also the approach of carrying out isolation (JP,9-330792,A etc.).

[0218] Then, the organic layer containing the luminous layer in the above-mentioned organic EL device is formed, and a luminescence function can be given to a part for the intersection of an electrode pair, if a counter-electrode is further prepared so that the aforementioned transparent electrode may be intersected. As for the above-mentioned insulator layer, it is desirable to make it leave after component formation, and it can avoid useless luminescence in the part which is not visible from a substrate side by existence of the above-mentioned insulator layer. Moreover, what is necessary is just to install a black MATORIKUSSU layer between color filter layers, when using a black matrix.

[0219] As a color filter used for <color filter and black matrix> i color filter this invention, only the following coloring matter can mention the thing of a solid state which dissolves or distributed coloring matter in binder resin, for example.

[0220] Red (R) coloring matter: Items, such as a perylene system pigment, a lake pigment, an azo system pigment, the Quinacridone system pigment, an anthraquinone system pigment, an anthracene system pigment, an iso indoline system pigment, and an isoindolinone system pigment, and at least two or more kinds of mixture [0221] Green (G) coloring matter: Items,

such as a halogen multi-permutation phthalocyanine system pigment, a halogen multi-permutation copper-phthalocyanine system pigment, TORIFERU methane system basic dye, an iso indoline system pigment, and an isoindolinone system pigment, and at least two or more kinds of mixture [0222] Blue (B) coloring matter: Items, such as a copper-phthalocyanine system pigment, an indan SURON system pigment, an indophenol system pigment, a cyanine system pigment, and a dioxazine system pigment, and at least two or more kinds of mixture

[0223] On the other hand, the transparent (50% or more of lights) ingredient of binder resin is desirable. For example, transparence resin (macromolecule), such as polymethylmethacrylate, polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, and a carboxymethyl cellulose, is mentioned.

[0224] In addition, in order to carry out separation arrangement of the color filter superficially, the photopolymer which can apply the photolithography method is also chosen. For example, the photo-curing mold resist ingredient which has reactant vinyl groups, such as an acrylic-acid system, a methacrylic-acid system, the Pori cinnamic-acid vinyl system, and a ring rubber system, is mentioned. Moreover, when using print processes, the printing ink (medium) using transparent resin is chosen. For example, transparence resin, such as the constituent which consists of the monomer of polyvinyl chloride resin, melamine resin, phenol resin, alkyd resin, an epoxy resin, polyurethane resin, polyester resin, maleic resin, and polyamide resin, oligomer, and a polymer and polymethylmethacrylate, polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, and a carboxymethyl cellulose, can be used.

[0225] When a color filter mainly consists of coloring matter When membranes are formed by vacuum deposition or the sputtering method through the mask of a desired color filter pattern and it consists of coloring matter and binder resin on the other hand A fluorochrome, the above-mentioned resin, and a resist are made to mix, distribute or solubilize. It is common to form membranes by approaches, such as a spin coat, a roll coat, and the cast method, to carry out patterning by the pattern of the color filter of a request [**** / carrying out patterning by the color filter pattern of a request by the photolithography method] by approaches, such as printing, to heat-treat, and to make it harden.

[0226] As for the thickness and the permeability of each color filter, considering as the following is desirable. R: 0.5-20 micrometers (50% or more of permeability, 610nm) of thickness, 0.5-20 micrometers (50% or more of permeability, 545nm) of G:thickness, B : 0.2-20 micrometers (50% or more of permeability, 460nm) of thickness

[0227] Moreover, what especially a color filter becomes from coloring matter and binder resin

should just be the range where the concentration of coloring matter can carry out patterning of the color filter satisfactory, and can penetrate luminescence of an organic EL device enough. 5-50 mass % Coloring matter is contained in the color filter film including the binder resin to be used although based also on the class of coloring matter.

[0228] ii) As a black matrix used for black matrix this invention, the pigmentum nigrum can be mentioned to the following metal and a metallic-oxide thin film, and a list, for example. As an example of a metal and a metallic-oxide thin film, the thin film of metals, such as chromium (Cr), nickel (nickel), and copper (Cu), and the oxide of those can be mentioned. As mixture of the above-mentioned metal and a metallic oxide, a with an optical density of 3.0 or more (10-300nm (100-3000Å) of thickness) thing is desirable.

[0229] As an example of the pigmentum nigrum, the coloring matter of carbon black, black titanium oxide, aniline black, or a color filter can be mixed, and the black-ized thing or the thing of a solid state which dissolves or distributed the above-mentioned coloring matter as well as a color filter in binder resin can be mentioned.

[0230] The sputtering method, vacuum deposition, a CVD method, etc., the membrane formation back can be performed on the whole display surface by the whole insulating substrate surface and the technique of masking, they can perform patterning by the photolithography method at least, and a metal and a metallic-oxide thin film can form the pattern of a black matrix.

[0231] When the pigmentum nigrum is used, patterning can be carried out like the case of a color filter, and a black matrix can be formed.

[0232] < protective layer (in transparence flat film > this invention, the protective layer (transparence flat film) used if needed is used, in order that a color filter (a black matrix is included) may protect getting damaged physically and deteriorating by the external environmental factor (water, oxygen, light.) It is desirable that it is a transparent (50% or more of lights) ingredient as the ingredient.

[0233] Specifically, what has the reactant vinyl group of an acrylate system and a methacrylate system can be mentioned like photo-curing mold resin and/or heat-curing mold resin. Moreover, transparence resin, such as the monomer of melamine resin, phenol resin, alkyd resin, an epoxy resin, polyurethane resin, polyester resin, maleic resin, and polyamide resin, oligomer, a polymer, polymethylmethacrylate, polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, polyimide, hydroxyethyl cellulose, and a carboxymethyl cellulose, can be mentioned. In order to raise the lightfastness of a color filter and an organic EL device, an ultraviolet ray absorbent can also be added in a protective layer.

[0234] A protective layer forms the above-mentioned ingredient by approaches, such as a spin coat, a roll coat, and the cast method, when liquefied, heat curing of the photo-curing mold resin is carried out if needed [after an exposure] for light, and heat curing of the heat-curing mold is carried out as it is after membrane formation. In the case of-like [film], a binder may be applied and stuck as it is.

[0235] If it becomes thick too much although there is especially no limit since protection layer thickness hardly affects an angle of visibility, since the permeability of light will be affected, it can usually choose in 1 micrometer - 5mm.

[0236] The transparence and electric insulation inorganic oxide layer which are used for <transparence and electric insulation inorganic oxide layer> this invention can be formed by carrying out a laminating on a color filter or a protective layer by vacuum evaporation or sputtering, DIPINGU, etc. In addition, this transparence and an electric insulation inorganic oxide layer may be monolayers, or may be a double layer more than a bilayer. For example, by considering as a bilayer, the elution of the inorganic ion from lower layer inorganic oxide layers (for example, soda-lime glass etc.) can be stopped in the upper inorganic oxide layer, and an organic EL device can be protected from elution ion.

[0237] As the ingredient, silicon oxide (SiO₂), an aluminum oxide (aluminum 2O₃), Titanium oxide (TiO₂), yttrium oxide (Y₂O₃), a germanium dioxide (GeO₂), A zinc oxide (ZnO), a magnesium oxide (MgO), a calcium oxide (CaO), Although a way acid (B-2 O₃), a strontium oxide (SrO), the barium oxide (BaO), a lead oxide (PbO), a zirconia (ZrO₂), sodium oxide

(Na₂O), lithium oxide (Li₂O), potassium oxide (K₂O), etc. can be mentioned Silicon oxide, an aluminum oxide, and titanium oxide have the high transparency of the layer (film), and the membrane formation temperature is low temperature (250 degrees C or less) comparatively, and since most color filters or protective layers are not degraded, it is desirable.

[0238] Moreover, the low-temperature (150 degrees C or less) actuation which sticks on a color filter or a protective layer is possible for the case of the glass plate which formed the compound more than a kind chosen from the group which consists of a glass plate or the above-mentioned silicon oxide, an aluminum oxide, titanium oxide, etc. as transparency and an electric insulation inorganic oxide layer on either [at least] the top face of a transparent insulating glass plate, or the inferior surface of tongue, and since a color filter top or a protective layer completely is not degraded, it is more desirable. Moreover, especially a glass plate has the large effectiveness which intercepts degradation gas, such as a steam, oxygen, or a monomer.

[0239] As a presentation of a glass plate, what is shown in Table 1 or 2 can be mentioned. Especially, soda-lime glass, barium strontium content glass, lead glass, aluminosilicate glass, borosilicate glass, barium borosilicate glass, etc. can be mentioned. In addition, the nitride (for example, Si₃N₄) may be contained here that an electric insulation inorganic oxide layer should just be what mainly contains an inorganic oxide as the presentation.

[0240] Although there will be especially no limit if the thickness of transparency and an electric insulation inorganic oxide layer does not bar luminescence of an organic EL device, in this invention, 0.01 micrometers or more 200 micrometers or less are desirable. The glass plate which formed the compound more than a kind chosen from the group which consists of a glass plate or the above-mentioned silicon oxide, an aluminum oxide, titanium oxide, etc. on either [at least] the top face of a transparent insulating glass plate or the inferior surface of tongue has 1 micrometers or more desirable 200 micrometers or less on the precision of sheet glass, and reinforcement. In addition, if the thickness of transparency and an electric insulation inorganic oxide layer becomes small, here Although it will be based also on the definition of a color filter if the monolayer of an inorganic oxide particle is approached, it becomes difficult to intercept degradation gas, such as a steam generated from a color filter or the organic substance of a protective layer, oxygen, or a monomer, and thickness becomes large Luminescence of an organic EL device narrows the angle of visibility of a leakage broth and multicolor luminescence from a gap with a color filter, and may reduce the practicality of multicolor luminescence equipment.

[0241]

[Table 1]

ガラス組成系	
1) R ₂ O-R'-O-SiO ₂ ・ Na ₂ O-CaO/MgO-SiO ₂ (ソーダ石灰ガラス) ・ Na ₂ O/K ₂ O-BaO/SrO-SiO ₂ ・ Na ₂ O/K ₂ O-CaO/ZnO-SiO ₂	
2) R ₂ O-PbO-SiO ₂ ・ K ₂ O/Na ₂ O-PbO-SiO ₂ (鉛ガラス)	
3) R ₂ O-B ₂ O ₃ -SiO ₂ ・ Na ₂ O-B ₂ O ₃ -SiO ₂ (ホウケイ酸ガラス) ・ K ₂ O-B ₂ O ₃ -SiO ₂	
4) R'-O-B ₂ O ₃ -SiO ₂ ・ PbO-B ₂ O ₃ -SiO ₂ ・ PbO/ZnO-B ₂ O ₃ -SiO ₂ ・ PbO-B ₂ O ₃ -SiO ₂ + (ファイラー) ・ ZnO-B ₂ O ₃ -SiO ₂	
5) R'-O-Al ₂ O ₃ -SiO ₂ ・ CaO/MgO-Al ₂ O ₃ -SiO ₂ (アルミノケイ酸塩ガラス) ・ MgO-Al ₂ O ₃ -SiO ₂ ・ PbO/ZnO-Al ₂ O ₃ -SiO ₂	
6) R ₂ O-Al ₂ O ₃ -SiO ₂ ・ Li ₂ O-Al ₂ O ₃ -SiO ₂ ・ Na ₂ O-Al ₂ O ₃ -SiO ₂	
7) R'-O-TiO ₂ -SiO ₂ ・ BaO-TiO ₂ -SiO ₂	

R' : 1価の元素
 R' : 2価の元素
 R' : 3価の元素

8) $R_2O-ZrO_2-SiO_2$ ・ $Na_2O/Li_2O-ZrO_2-SiO_2$
9) $R'O-P_2O_5-SiO_2$ ・ $CaO-P_2O_5-SiO_2$
10) $R'O-SiO_2$ ・ $CaO/BaO/PbO-SiO_2$
11) SiO_2
12) $R_2O-R'O-B_2O_3$ ・ $Li_2O-BeO-B_2O_3$
13) $R'O-R_2'O_3-B_2O_3$ ・ $CaO/BaO-Al_2O_3-B_2O_3$ ・ $CaO/PbO-Lu_2O_3-B_2O_3$
14) $R_2O-Al_2O_3-P_2O_5$ ・ $K_2O-Al_2O_3-P_2O_5$
15) $R'O-Al_2O_3-P_2O_5$ ・ $BaO/CaO-Al_2O_3-P_2O_5$ ・ $ZnO-Al_2O_3-P_2O_5$

[0242]

[Table 2]

区 分	組 成 物 (主として1〜3成分系として表わす)
1 単酸化物	$SiO_2, B_2O_3, GeO_2, As_2O_3$
2 ケイ酸塩	$Li_2O-SiO_2, Na_2O-SiO_2, K_2O-SiO_2$ $MgO-SiO_2, CaO-SiO_2, BaO-SiO_2, PbO-SiO_2$ $Na_2O-CaO-SiO_2$ $Al_2O_3-SiO_2$
3 ホウ酸塩	$Li_2O-B_2O_3, Na_2O-B_2O_3, K_2O-B_2O_3$ $MgO-B_2O_3, CaO-B_2O_3, PbO-B_2O_3$ $Na_2O-CaO-B_2O_3, ZnO-PbO-B_2O_3$ $Al_2O_3-B_2O_3, SiO_2-B_2O_3$
4 リン酸塩	$Li_2O-P_2O_5, Na_2O-P_2O_5$ $MgO-P_2O_5, CaO-P_2O_5, BaO-P_2O_5$ $K_2O-BaO-P_2O_5$ $Al_2O_3-P_2O_5, SiO_2-P_2O_5, B_2O_3-P_2O_5$ $V_2O_5-P_2O_5, Fe_2O_3-P_2O_5, WO_3-P_2O_5$
5 ゲルマン酸塩ガラス	$Li_2O-GeO_2, Na_2O-GeO_2, K_2O-GeO_2$ $B_2O_3-GeO_2, SiO_2-GeO_2$
6 タングステン酸塩	Na_2O-WO_3, K_2O-WO_3
7 モリブデン酸塩	$Na_2O-MoO_3, K_2O-MoO_3, Li_2O-MoO_3$
8 テルル酸塩	Na_2O-TeO_2
9 ホウケイ酸塩	$Na_2O-B_2O_3-SiO_2$
10 アルミノケイ酸塩	$Na_2O-Al_2O_3-SiO_2, CaO-Al_2O_3-SiO_2$
11 アルミノホウ酸塩	$CaO-Al_2O_3-B_2O_3, ZnO-Al_2O_3-B_2O_3$
12 アルミノホウケイ酸塩	$Na_2O-Al_2O_3-B_2O_3-SiO_2$
13 フッ化物	$BeF_2, NaF-BeF_2$ $ZrF_4-BaF_2-ThF_4, GdF_3-BaF_2-ZrF_4$
14 フッリン酸塩	$Al(P_2O_3)_3-AlF_3-NaF-CaF_2$
15 オキシハロゲン化物	$Ag_2O-AgI-P_2O_5$
16 オキシナイトライド	$MgO-Al_2O_3-AlN-SiO_2$

[0243] The <manufacture approach of an organic EL device>, next the manufacture approach of the organic EL device of this invention are explained. As for an anode plate, it is desirable to form by vapor growth, such as vacuum deposition and a spatter.

[0244] Although forming by vacuum deposition or the spatter is possible, when the point which forms membranes on an organic layer is taken into consideration, vacuum deposition of cathode with few damages to an organic layer is desirable.

[0245] It is desirable to use a vacuum deposition method for formation of organic layers, such as a luminous layer, since a homogeneous thin film can be formed. When a vacuum deposition method is used, an amorphous condition or the diameter of crystal grain is 0.1 micrometers. The following (0.001 micrometers of lower limits are usually extent.) homogeneous thin films are obtained. The diameter of crystal grain is 0.1 micrometers. If it has exceeded, it will become uneven luminescence, driver voltage of a component must be made high, and the injection efficiency of a charge will also fall remarkably.

[0246] Considering as the degree of vacuum of 10 – 3 or less Pa, although especially the conditions of vacuum deposition are not limited, an evaporation rate is 0.1 – 1 nm/sec. Considering as extent is desirable. Moreover, it is desirable to form each class continuously in a vacuum. If it forms continuously in a vacuum, since it can prevent an impurity sticking to the interface of each class, a high property is acquired. Moreover, driver voltage of a component can be made low or generating and growth of a dark spot can be suppressed.

[0247] When using a vacuum deposition method for formation of these each class, the vapor codeposition evaporated from a source of vacuum evaporation which a mixolimnion etc. carries out temperature control of each boat into which the compound was put when making one layer contain two or more compounds according to an individual, and is different is desirable, but when vapor pressure (evaporation temperature) is comparable or very near, it can be made to be able to mix within the same vacuum evaporation board beforehand, and can also vapor-deposit.

[0248] moreover — in addition, the solution applying methods (a spin coat, a DIP, cast, etc.) and Langmuir BUROJETTO (LB) — law etc. can also be used. It is good also as a configuration which distributes each compound in matrix matter (resin binder), such as a polymer, by the solution applying method. In addition, it is as [approach / of a color filter / formation] above-mentioned.

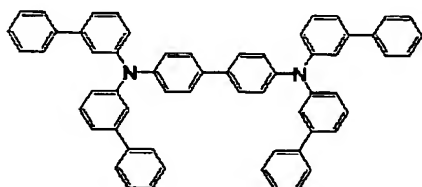
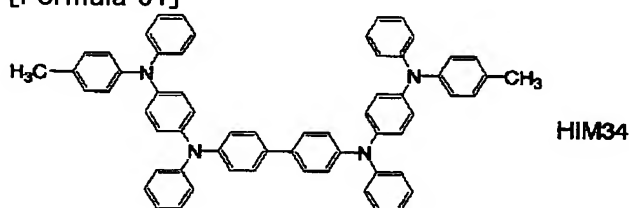
[0249] Although the organic EL device of this invention is used as an EL element of a direct-current drive mold, it can usually be alternating-current-driven or pulse driven. Applied voltage is usually 2–10V. It is lower than extent and the conventional thing.

[0250]

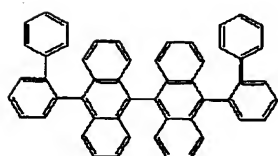
[Example] Hereafter, the example of this invention is shown with the example of reference, and this invention is further explained to a detail. The structure expression of the compound used in the example is shown.

[0251]

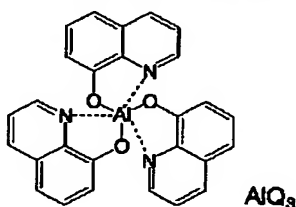
[Formula 61]



テトラアリールベンジジン誘導体(No.I-1)



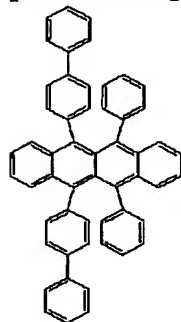
フルオレン誘導体(No.I-2)



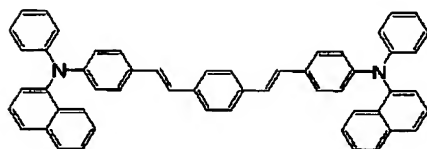
ノエールノフンヒノ誘導体(No.1-1)

[0252]

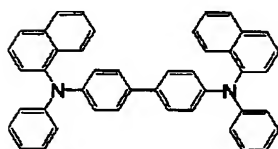
[Formula 62]



ナフタセン誘導体(No.20)



スチリルアミン誘導体(S-9)



N,N'-ジ(1-ナフチル)-N,N'-ジフェニルベンジジン(NPB)

[0253] On the <example 1> glass substrate, 100nm (anode plate) of ITO transparent electrodes was formed in the sputter.

[0254] And the glass substrate which formed the ITO transparent electrode was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. The substrate is pulled up out of boiling ethanol, and it dries, and is UV/O₃. After washing, it fixed to the substrate electrode holder of a vacuum evaporation system, and the vacuum tub was decompressed to 1×10^{-4} or less Pa.

[0255] subsequently, N and N' - diphenyl-N and N' - screw [N-phenyl-N-4-tolyl (4-aminophenyl)] benzidine (HIM34) — evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 20nm, and considered as the hole impregnation layer.

[0256] They are N, N, N', and an N'-tetrakis-(3-biphenyl-1-IRU) benzidine (tetra-aryl benzidine derivative (No.1-1)) Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 20nm, and considered as the hole transportation layer.

[0257] furthermore, a tetra-aryl benzidine derivative (No.1-1), and 10, 10'-screw [2-biphenyl]-9 and 9' — a volume ratio is set to 1:3 in — BIAN thrill (phenyl anthracene derivative (No.1-1)) — as — and a naphthacene derivative (No.20) — 3.0vol(s)% — vapor codeposition was carried out to the thickness of 30nm so that it might contain, and it considered as the first mixolimnion type luminous layer. The evaporation rate at this time was made into 0.05 nm/sec, 0.15 nm/sec, and 0.006 nm/sec at order.

[0258] moreover, a volume ratio is set to 1:3 in a tetra-aryl benzidine derivative (No.1-1) and a phenyl anthracene derivative (No.1-1) — as — and a styryl amine derivative (S-9) — 3.0vol (s)% — vapor codeposition was carried out to the thickness of 50nm so that it might contain, and it considered as the second mixolimnion type blue luminous layer. The evaporation rate at this time was made into 0.05 nm/sec, 0.15 nm/sec, and 0.006 nm/sec at order.

[0259] Subsequently, with the reduced pressure condition maintained, the phenyl anthracene derivative (No.1-1) was vapor-deposited in thickness of 20nm by evaporation rate 0.05 nm/sec, and it considered as the electronic transportation layer. Moreover, tris (8-quinolinolato) aluminum (AlQ3) was vapor-deposited in thickness of 10nm by evaporation rate

0.2 nm/sec, and it considered as the electron injection layer.

[0260] Furthermore, it is CsI, with reduced pressure maintained Evaporation rate 0.05 nm/sec It vapor-deposited in thickness of 0.2nm, and MgAg (mass ratio 10:1) was vapor-deposited in thickness of 200nm by evaporation rate 0.2 nm/sec on this, it considered as cathode, 100nm of aluminum was vapor-deposited as a protective layer, and the organic EL device was obtained.

[0261] As such an organic EL device is shown in drawing 1 , it has an anode plate 2 on a substrate 1. It has the hole impregnation layer 3, the hole transportation layer 4, the first mixolimnion type luminous layer 5, the second mixolimnion type luminous layer 6, the electronic transportation layer 7, and the electron injection layer 8 in this order on it. It has the cathode which furthermore consisted of a cathode lower layer 9 formed with the alkali metal compound on this, and the cathode upper layer 10 formed with the small metal of a work function, and luminescence light is taken out from a substrate 1 side.

[0262] When this organic EL device was driven by the constant current consistency of 10 mA/cm², initial brightness was 1100 cd/m² and driver voltage 6.0V. The luminescent color was white. Moreover, the half-life of brightness was 600 hours in 2 and driver voltage 9.9V the initial brightness of 9000cds/cm at the constant current drive of 100 mA/cm², and was 50000 hours in initial brightness 1100 cd/cm² and driver voltage 6.0V at the constant current drive of 10 mA/cm².

[0263] In the component of the <example 2> example 1 instead of (a tetra-aryl benzidine derivative (No.1-1)) Use N, N'-JI (1-naphthyl)-N, and an N'-diphenyl benzidine (NPB), and also a component is obtained similarly. White luminescence is obtained when a property is evaluated similarly. By the constant current drive of 100 mA/cm² by initial brightness 9000 cd/cm² and driver voltage 9.8V It was brightness half-life 500 hours, and was brightness half-life 35000 hours in initial brightness 1100 cd/m² and driver voltage 5.5V at the constant current drive of 10 mA/cm².

[0264] In the component of the <example 3> example 1, shall not prepare the 1st mixolimnion type luminous layer, and also a component is obtained similarly. Blue luminescence is obtained when a property is evaluated similarly. By the constant current drive of 100 mA/cm² by initial brightness 8500 cd/m² and driver voltage 7.8V It was brightness half-life 500 hours, and was brightness half-life 30000 hours in initial brightness 900 cd/m² and driver voltage 6.0V at the constant current drive of 10 mA/cm².

[0265] In addition, the emission spectrum of the organic EL device of examples 1 and 3 is shown in drawing 2 . The organic EL device of an example 1 shows luminescence with the blue organic EL device of white and an example 3.

[0266] The component was produced like the <example 1 of reference> example 1. However, not using the cesium iodide used as an electron injection electrode, direct MgAg was vapor-deposited on AlQ3, and it considered as the electrode.

[0267] The brightness in 10 mA/cm² became Orange luminescence of driver voltage 9.0V by 400 cd/m². When the emission spectrum was measured, 90% or more was luminescence from a naphthacene derivative (No.20).

[0268] Moreover, when the luminescence life was measured, the brightness half line of the brightness in the constant current drive of 100 mA/cm² was 4 hours in 4000 cd/m². The fall of the reinforcement of blue luminescence was especially large.

[0269] The component was produced like the <example 2 of reference> example 1. However, the luminous layer was made into the independent host of a phenyl anthracene derivative (No.1-1) from the mixolimnion host of (a tetra-aryl benzidine derivative (No.1-1)) and a phenyl anthracene derivative (No.1-1), and the naphthacene derivative (No.20) and the styryl amine derivative (S-9) were doped similarly.

[0270] The brightness in the constant current drive of 10 mA/cm² became Orange luminescence of driver voltage 7.5V by 900 cd/m². When the emission spectrum was measured, 75% or more was luminescence from a naphthacene derivative (No.20).

[0271] Moreover, when the luminescence life was measured, the brightness half line of the brightness in the constant current drive of 100 mA/cm² was 100 hours in 9000 cd/m². The

fall of the reinforcement of blue luminescence was especially large.

[0272] <Example 4> [production of an organic electroluminescence display]

Scrub washing of the trade name by Corning, Inc. 7059 substrate was carried out using neutral detergent as a glass substrate.

[0273] In order to form a color filter in this substrate, spreading and the patterning process of the most common pigment-content powder type color filter as the colorization technique of a liquid crystal display were given. Red, green, and ***** are 1.0–1.5 micrometers. Spreading conditions were decided to become filter thickness and desired patterning was performed. The spin coat of the color filter material for red was carried out for about 5 seconds by 1000rpm, and it prebaked at 100 degrees C for 3 minutes. Alignment of the photo mask was carried out with the exposure machine, and 20mW ultraviolet radiation was developed after the 30-second exposure in the TMAH (tetra methyl ammonium hydride) water solution of about 0.1 mass % concentration. Developing time was about 1 minute. The cure was carried out at 220 degrees C for 1 hour so that it might not dissolve in the color filter liquid of another color applied after this, and it considered as the red color filter. About other colors, since ingredients (pigment) differed, although detailed formation conditions differed, the almost same process was performed one by one, and the color filter was formed.

[0274] Next, in order to raise the surface smoothness of the field which forms ITO after this, the overcoat material of acrylic resin was applied, desired patterning was performed, the cure was carried out at about 220 degrees C for 1 hour, and the overcoat layer was obtained. the thickness of an overcoat layer — about 3 micrometers it was .

[0275] And about 100nm of ITO(s) was formed by the spatter as transparence electric conduction film, after forming a resist pattern with photolithography, it etched with dilute hydrochloric acid, and the resist was exfoliated, and the ITO pattern was obtained.

[0276] SiO₂ is formed by the spatter as an insulator layer on ITO which carried out patterning, as remained in SiO₂ in addition to the part whose luminescence can be further seen from a glass substrate side, pattern NINGU is carried out, and it is about 0.1 micrometers about SiO₂ insulator layer. It formed in thickness.

[0277] Next, like the example 1, the organic layer, the cathode, and the protective layer of an organic EL device were formed, and white and the organic electroluminescence display which has each green and blue dot were produced. Pixel size is 2mmx2mm and the number of pixels was made into 1 dot of each color.

[0278] When the constant current drive of this was carried out by 100 mA/cm² and luminescence of each color was checked, the brightness and CIE chromaticity of each color were as follows.

[0279]

	輝度 cd/m ²	C I E x/y
白色	5 2 6 0	0. 3 2 / 0. 3 4
赤色	9 3 4	0. 6 2 / 0. 3 4
緑色	2 9 0 0	0. 3 1 / 0. 5 0
青色	7 4 4	0. 1 2 / 0. 1 4

[0280] <Example 5> [production of a simple matrix type organic electroluminescence color display]

The substrate prepared like the example 4 is fixed to the substrate electrode holder of a sputtering system, and it is about 1.5 micrometers about aluminum. The spatter was carried out to thickness, the spatter of the TiN was continuously carried out to about 30nm thickness, and the cascade screen of aluminum and TiN was formed. Since aluminum and TiN are formed continuously, without breaking a vacuum, it is prevented that the natural oxidation film is formed in the front face of aluminum layer, and good contact of aluminum and TiN is acquired. Patterning of this cascade screen was carried out with photolithography, and low resistance wiring was formed.

[0281] The color filter and the overcoat layer were formed by the same approach as an example 4. It was made for a pattern to expose the front face of a TiN layer.

[0282] And the ITO pattern as transparency electric conduction film was also formed by the same approach as an example 4. Low resistance aluminum wiring formed previously is connected now with ITO, and it becomes a column line.

[0283] SiO₂ is formed by the sputter as an insulator layer on ITO which carried out patterning, as remained in SiO₂ in addition to the part whose luminescence can be further seen from a glass substrate side, patterning is carried out, and it is about 0.1 micrometers about SiO₂ insulator layer. It formed in thickness. Useless luminescence in the part which is not visible from a glass substrate side by this is avoidable. Moreover, it can also be prevented, although the organic electroluminescence layer vapor-deposited by the inclined part becomes thin and tends to cause current leak, since this part becomes a hole thru/or a slot.

[0284] Next, it is 2 micrometers of thickness about what adjusted the concentration of polyimide to 15 mass %. The spin coat was carried out so that it might become, and it prebaked at 145 degrees C for 1 hour, and the spacer film of a midcourse phase was formed. Then, POJIREJISUTO was applied, in order to form a desired photograph pattern, negatives were exposed and developed, and the bamboo hat-like photopolymer object was formed. The spacer film of the midcourse phase of the polyimide exposed at the time of the development of POJIREJISUTO is also removed by the developer following on POJIREJISUTO, and is formed in a final spacer configuration. Thereby, component isolation construction was formed.

[0285] Next, like an example 1, the organic layer, the cathode, and the protective coat of an organic EL device are formed, and the size of 1 pixel is 330 micrometers. x110micrometer The simple matrix type color display of a number of pixels 320x240xRGB dot was produced.

[0286] When the line sequential drive of this was carried out, color luminescence was obtained with the same CIE chromaticity as an example 4.

[0287] In the <example 6> example 4, performed alignment, and the black matrix was installed between color filters, and also the display was produced similarly. When driven similarly, a more sharp luminescence light was obtained compared with the example 4. The black matrix also used the general pigment-content powder type thing.

[0288] In the <example 7> example 4, after preparing the overcoat layer of acrylic resin, the protective coat should be further prepared for SiO₂ film on it at about 60nm thickness, and also the display was produced similarly. When driven similarly, the same result as an example 4 was obtained. Moreover, it turned out that the endurance of a component improves more.

[0289]

[Effect of the Invention] According to this invention, blue luminescence light is obtained efficiently. The correspondence to multicolor luminescence which furthermore includes blue luminescence is possible, and a long lasting organic EL device is obtained by high brightness. Furthermore, taking advantage of the property which was excellent in the organic EL device, the multicolor luminescence organic display by combination with a color filter is producible.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to an organic electroluminescence (electroluminescence) component.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] An organic EL device is a component which emits light using emission (fluorescence and phosphorescence) of the light at the time of making an exciton (exciton) generate and this exciton deactivating by having the configuration whose thin film containing a fluorescence organic compound was pinched in cathode and an anode plate, and making an electron and an electron hole pour in and recombine with a thin film.

[0003] An organic EL device is 100 – 100,000 cd/m² at the low battery not more than 10V. Field luminescence of high brightness of extent is possible. Moreover, luminescence from blue to red is possible by choosing the class of fluorescent material.

[0004] On the other hand, the trouble of an organic EL device is that a luminescence life is short and preservation endurance and dependability are low, and is the physical change (ununiformity-ization of an interface arises by crystal domain growth etc., and it becomes the cause of degradation, the short circuit, and dielectric breakdown of the charge impregnation ability of a component.) of (1) organic compound as this cause. If especially a with a molecular weight of 500 or less low molecular weight compound is used, an appearance and growth of crystal grain will take place, and membranous will fall remarkably. Even if ruined, an appearance and growth of remarkable crystal grain take place, decline in luminous efficiency and leak of a current are caused, and it stops moreover, emitting light. Moreover, it also becomes the cause of the dark spot which is a partial non-light-emitting part.

[0005] (2) Oxidation and exfoliation of cathode (although Na-K-Li-Mg-calcium-aluminum etc. has been used for cathode as a small metal of a work function in order to make impregnation of an electron easy, as for these metals, it reacts with the moisture in atmospheric air, and oxygen, or exfoliation with an organic layer and cathode takes place, and charge impregnation becomes impossible) When membranes are especially formed on a spin coat etc. using a high molecular compound etc., the residual solvent and moisture, and decomposition product at the time of membrane formation promote oxidation reaction of an electrode, exfoliation of an electrode takes place, and a partial non-light-emitting part is produced.

[0006] (3) Luminous efficiency is low and there is much calorific value (since a current is passed in an organic compound, an organic compound must be put on the bottom of high field strength, and generation of heat is not escaped.). Degradation and destruction of a component take place by melting, crystallization, the pyrolysis, etc. of an organic compound for the heat.

[0007] (4) Photochemistry-change, electrochemical change, etc. of an organic compound layer (the organic substance deteriorates by passing a current to the organic substance, defects, such as a current trap and an exciton trap, are produced, and component degradation of the rise of driver voltage, a fall of brightness, etc. takes place.) are mentioned.

[0008] Although an organic EL device enables implementation of multicolor luminescence as mentioned above, the laminating mold white luminescence organic EL device is proposed as a thing corresponding to the formation of multicolor luminescence of an organic EL device [Yoshiharu Sato, Shingaku Giho, and OME-94-78 (1995-03)]. The luminous layer in this case carries out the laminating of the red luminous layer which doped the red fluorochrome (P-660, DCM1) to the green luminous layer and tris (8-quinolinolato) aluminum using the blue luminous layer which used the zincky oxazole complex, and tris (8-quinolinolato) aluminum.

[0009] Moreover, previously, as a thing aiming at multicolor luminescence, with the above components, since the degree of freedom of adjustment of material selection or the

luminescent color is restricted greatly, this invention person etc. has proposed the technique which carries out multicolor luminescence by addition of a dopant (WO 98/No. 08360). It is changing a mixing ratio and a dopant kind, the luminescence property is changed, and, specifically, multicolor luminescence is enabled. [in / the dopant of rubrene or a coumarin derivative is added to a mixolimnion with an N'-tetrakis-(3-biphenyl-1-IRU) benzidine, and / tris (8-quinolinolato) aluminum, N, N, N', and / a mixolimnion]

[0010] However, the luminescent color indicated concretely there does not correspond to red - green, and does not correspond to blue.

[0011] Then, although to be stabilized and to obtain the blue luminescent color is desired, there is a characteristic problem which accompanies it and selection of the various ingredients combined only not only in luminescent material is needed.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, blue luminescence light is obtained efficiently. The correspondence to multicolor luminescence which furthermore includes blue luminescence is possible, and a long lasting organic EL device is obtained by high brightness. Furthermore, taking advantage of the property which was excellent in the organic EL device, the multicolor luminescence organic display by combination with a color filter is producible.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Blue luminescence light is offering the organic EL device excellent in the dependability acquired efficiently, and the purpose of this invention is offering a long lasting organic EL device by high brightness possible [the correspondence to multicolor luminescence which includes blue luminescence further]. Furthermore, production of a multicolor luminescence organic electroluminescence display is offering the organic EL device which becomes possible by combining a color filter further taking advantage of the outstanding property.

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MEANS

[Means for Solving the Problem] Such a purpose is attained by following this invention.

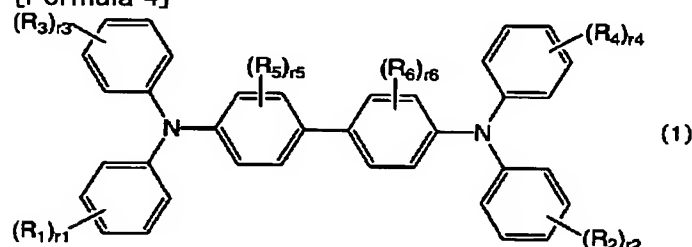
- (1) The organic EL device with which it has a luminous layer, and the hole transportation layer and/or electronic transportation layer which adjoin this luminous layer, and is constituted above one layer in which said luminous layer contains a blue luminous layer, or two-layer, and said blue luminous layer contains the hole impregnation transportability compound and/or electron injection transportability compound in said hole transportation layer and/or an electronic transportation layer as a host compound.
- (2) The organic EL device of the above (1) which is the compound in which a host compound carries out blue luminescence.
- (3) The organic EL device of the above (2) with which a host compound is chosen from a phenyl anthracene derivative.
- (4) The organic EL device of the above (1) which contains a dopant and carries out blue luminescence by the dopant.
- (5) The organic EL device of the above (1) whose blue luminous layer it has a hole transportation layer and an electronic transportation layer, and is a mixolimnion of the hole impregnation transportability compound in said hole transportation layer and an electronic transportation layer, and an electron injection transportability compound.
- (6) The organic EL device of the above (5) whose blue luminous layer is a mixolimnion of a phenyl anthracene derivative and the third class amine of aromatic series.
- (7) The above (5) with uniform concentration distribution of the hole impregnation transportability compound in a mixolimnion and an electron injection transportability compound, or (6) organic EL devices.
- (8) the hole impregnation transportability compound and electron injection transportability compound in a mixolimnion -- the direction of thickness -- concentration distribution -- having -- a hole transportation layer side -- the concentration of a hole impregnation transportability compound -- high -- an electronic transportation layer side -- the above (5) with the high concentration of an electron injection transportability compound, or the organic EL device of (6).
- (9) One organic EL device of above-mentioned (5) - (8) which is the mixolimnion by which the dopant was furthermore doped.
- (10) One organic EL device of above-mentioned (5) - (9) which carries out blue luminescence by the whole mixolimnion.
- (11) One organic EL device of above-mentioned (1) - (10) with which the component of the cathode established in an electronic transportation layer side contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.
- (12) The organic EL device of the above (11) with which the component of cathode contains at least one sort of compounds chosen from the halogenide of Rb and Cs.
- (13) The organic EL device with which it has cathode, the luminous layer more than one layer containing a blue luminous layer, or two-layer, a hole transportation layer and/or an impregnation layer, and an anode plate, and the component of said cathode contains at least one sort of compounds chosen from the halogenide and oxide of alkali metal.
- (14) The organic EL device of the above (13) which contains a phenyl anthracene derivative as a compound in which a blue luminous layer carries out blue luminescence.

(15) The above (13) whose hole transportation and/or impregnation layer contain the third class amine of aromatic series, or (14) organic EL devices.

(16) The organic EL device of the above (15) with which the third class amine of aromatic series is chosen from the compound expressed with a formula (1) and a formula (2).

[0014]

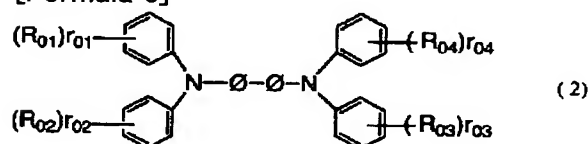
[Formula 4]



[0015] In [type (1) R1, R2, R3, and R4 An aryl group, an alkyl group, an alkoxy group, an aryloxy group, or a halogen radical is expressed, respectively. r1, r2, r3, and r4 It is the integer of 0-5, respectively, and r1, r2, r3, and r4 may combine mutually R1 comrades which adjoin at the time of two or more integers, R2 comrades, R3 comrades, and R4 comrades, respectively, and they may form a ring, respectively. R5 And R6 Expressing an alkyl group, an alkoxy group, the amino group, or a halogen radical, respectively, r5 and r6 are the integers of 0-4, respectively.]

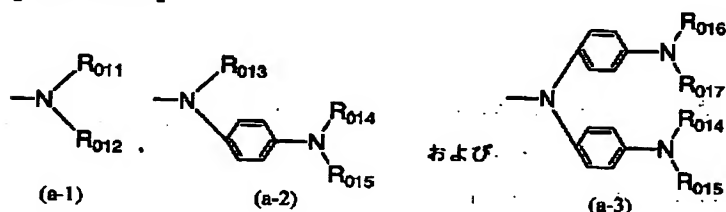
[0016]

[Formula 5]



[0017] In [type (2), phi expresses a phenylene group, and R01, R02, R03, and R04 are an alkyl group, an aryl group, and a diaryl amino aryl group, respectively, [0018]

[Formula 6]



(ここで、R011、R012、R013、R014、R015、R016およびR017は、それぞれ、アリール基を表す。)

[0019] Expressing whether it is *****, at least one of R01-the R04 expresses a diaryl amino aryl group or the above (a-1) of - (a-3), and either. r01, r02, r03, and r04 are the integers of 0-5, respectively, and r01+r02+r03+r04 are one or more integers. When r01, r02, r03, and r04 are two or more integers, respectively, it may join together mutually, respectively and R01 adjoining comrades, R02 comrades, R03 comrades, and R04 comrades may form a ring.]

(17) The above (15) whose hole transportation layer by the side of a luminous layer have a hole impregnation layer and a hole transportation layer, the hole impregnation layer by the side of an anode plate contains the compound expressed with a formula (2), and contains the compound expressed with a formula (1), or (16) organic EL devices.

(18) One organic EL device of above-mentioned (1) - (17) which has the luminous layer of at least one layer in which luminescence wavelength differs from this other than a blue luminous layer.

(19) The organic EL device of the above (18) whose luminous layer of at least one layer from which a blue luminous layer differs in luminescence wavelength is a mixolimnion of a hole impregnation transportability compound and an electron injection transportability compound.

(20) The organic EL device of the above (19) which is the mixolimnion by which the dopant was furthermore doped.

(21) One organic EL device of above-mentioned (18) – (20) which has a two-layer luminous layer.

(22) One organic EL device of above-mentioned (18) – (20) which has the luminous layer of three layers.

(23) The above (21) which carries out white luminescence, or (22) organic EL devices.

(24) One organic EL device of above-mentioned (1) – (23) which modulates the luminescent color combining this color filter using a color filter.

(25) The organic EL device of the above (24) which counters mutually and with which at least one side has the electrode of a transparent pair, the organic layer which contains said luminous layer in inter-electrode [of this pair] is pinched, and said color filter is installed in the transparent electrode side of the electrode of this pair.

(26) The organic EL device of the above (24) with which each consists of two or more electrodes, and it crosses mutually, and it has XY matrix type electrode of a pair at least with transparent one side arranged in the location which counters, and the organic layer which contains said luminous layer in inter-electrode [crossing / said] is pinched, the amount of this intersection forms a pixel, and said color filter is installed in the transparent electrode side of this pixel.

(27) The organic EL device of the above (26) with which it is the periphery of said pixel and the black matrix is installed near the installation part of said color filter.

[0020]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail. The compound which has the blue luminous layer which uses as a host ingredient the hole impregnation transportability compound and/or electron injection transportability compound in the hole transportation layer which adjoins a luminous layer, and/or an electronic transportation layer, and has a blue luminous layer again, or is chosen from the chloride and oxide of alkali metal as a cathode material is used for the organic EL device of this invention. Preferably, it has these configurations and, as for a blue luminous layer, it is desirable that it is the mixolimnion of the aforementioned hole impregnation transportability compound and an electron injection transportability compound. Furthermore, it explains in full detail.

[0021] The organic EL device of <blue luminous layer> this invention has a blue luminous layer. As a compound in this case which carries out blue luminescence, a phenyl anthracene derivative is used preferably. These are indicated by JP,8-12600,A. Especially, the compound expressed with a formula (A) as a phenyl anthracene derivative is desirable.

A1 –L–A2 (A)

[0022] It sets at a ceremony (A) and is A1. And A2 A monochrome (alt.permutation phenyl) anthryl radical or a JI (alt.permutation phenyl) anthryl radical is expressed respectively, and these may be the same or may differ. L expresses single bond or the connection radical of bivalence.

[0023] A1 and A2 The monochrome (alt.permutation phenyl) phenyl anthryl radical or JI (alt.permutation phenyl) phenyl anthryl radical expressed has an aryl group, a complex ring radical, or an aryl ethenyl radical in the 2nd place of a phenyl group, or the 6th place (it is the ortho position to the joint location to an anthracene ring). Moreover, you may have a substituent in addition to the ortho position, an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, the amino group, etc. may be mentioned as a substituent in the case of having a substituent, and these substituents may be permuted further. About these substituents, it mentions later.

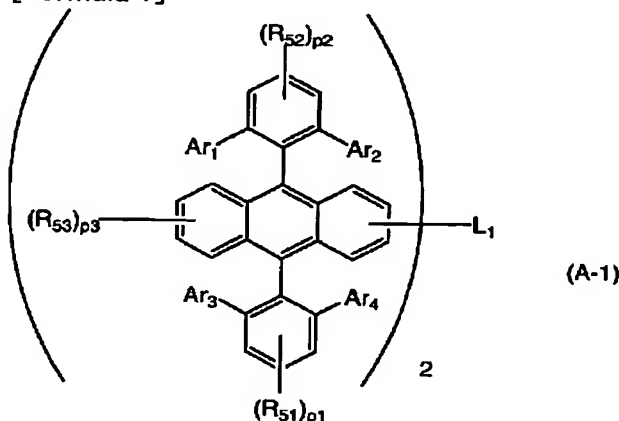
[0024] Moreover, as for the joint location of the phenyl group in an anthracene ring, it is desirable that they are the 9th place of an anthracene ring and the 10th place.

[0025] In a formula (A), although L expresses the radical of single bond or bivalence, the

arylene radical between which you may be placed by the alkylene group etc. as a radical of the bivalence expressed with L is desirable. About such an arylene radical, it mentions later. [0026] Also in the phenyl anthracene derivative shown by the formula (A), what is shown by the formula (A-1) and the formula (A-2) is desirable.

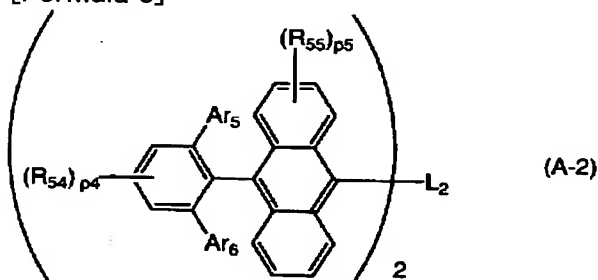
[0027]

[Formula 7]



[0028]

[Formula 8]



[0029] It sets at a ceremony (A-1), and is Ar1 -Ar4. A hydrogen atom, an aryl group, a complex ring radical, or an aryl ethenyl radical is expressed respectively, and it is Ar1. And Ar2 On the other hand, it is Ar3 to a row at least. And Ar4 At least one side is an aryl group, a complex ring radical, or an aryl ethenyl radical respectively. R51 and R52 express an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, or the amino group respectively, and these may be the same or may differ. p1 and p2 express the integer of 0-3 respectively, and when p1 and p2 are two or more integers respectively, R51 comrades and R52 comrades may be respectively the same, or may differ from each other. R53 expresses an alkyl group or an aryl group, and p3 expresses the integer of 0-3 respectively. When p3 is two or more integers, R53 may be respectively the same or may differ. L1 Single bond or an arylene radical may be expressed and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene.

[0030] It sets at a ceremony (A-2), and is Ar5. And Ar6 A hydrogen atom, an aryl group, a complex ring radical, or an aryl ethenyl radical is expressed respectively, and it is Ar5. And Ar6 At least one side is an aryl group, a complex ring radical, or an aryl ethenyl radical. R54 expresses an alkyl group, an aryl group, an aryl ethenyl radical, an alkoxy group, or the amino group respectively, and these may be the same or may differ. p4 expresses the integer of 0-3 respectively, and when p4 is two or more integers respectively, R54 comrades may be respectively the same or may differ. R55 expresses an alkyl group or an aryl group, and p5 expresses the integer of 0-4 respectively. When p5 is two or more integers, R55 may be respectively the same or may differ. L2 Single bond or an arylene radical may be expressed and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene. L2 may express single bond or an arylene radical,

and, as for an arylene radical, an alkylene group, -O-, -S-, or -NR- (here, R expresses an alkyl group or an aryl group.) may intervene.

[0031] Ar1 -Ar4 And as an aryl group expressed with R51-R53, the thing of carbon numbers 6-20 may be desirable, and may have substituents, such as a phenyl group and a tolyl group, further. Specifically, a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a naphthyl group, an anthryl radical, a biphenyl radical, a phenyl anthryl radical, a tolyl anthryl radical, etc. are mentioned.

[0032] Ar1 -Ar4 As a complex ring radical expressed A furil radical, a benzo furil radical, a thienyl group, a BICHIENIRU radical, a benzo thienyl group, A pyrrolyl radical, N-allyl compound pyrrolyl radical, an indolyl radical, a pyridyl radical, a bipyridyl radical, A quinolyl radical, a quinoxalyl radical, an oxazole radical, a benzo oxazole radical, An OKISA diazole radical, a thiazole radical, a benzothiazole radical, a thiadiazole radical, an imidazole group, etc. are desirable. Further You may have substituents, such as a with a carbon number of 42 or less aryl group, a with a carbon number of 12 or less alkyl group, an alkoxy group, an aryloxy radical, an amino group, a cyano group, and a nitro group. Specifically, a phenyl group, a biphenyl (o-, m-, p-) radical, a naphthyl group (1 2), a methyl group, an ethyl group, a propyl group, butyl, a methoxy group, an ethoxy radical, a phenoxy group, a tolyl group (o-, m-, p-), etc. are mentioned as a substituent.

[0033] As Ar1 -Ar4 and an aryl ethenyl radical expressed with R51 and R52, 2-phenyl ethenyl radical, 2, and 2-diphenyl ethenyl radical etc. may be desirable, and may have substituents, such as an aryl group, an alkyl group, an alkoxy group, an aryloxy radical, an amino group, a cyano group, and a nitro group, further. Specifically, a phenyl group, a biphenyl (o-, m-, p-) radical, a naphthyl group (1 2), a methyl group, an ethyl group, a propyl group, butyl, a methoxy group, an ethoxy radical, a phenoxy group, a tolyl group (o-, m-, p-), etc. are mentioned as a substituent.

[0034] As an alkyl group expressed with R51-R53, you may have branching also by the shape of a straight chain, and the alkyl group which is not permuted [the permutation of 1-4 or] is desirable to carbon numbers 1-10 and a pan. Especially, the alkyl group which is not permuted [of carbon numbers 1-4] is desirable, and a methyl group, an ethyl group, a propyl group (n-, i-), butyl (n-, i-, s-, t-), etc. are specifically mentioned.

[0035] As an alkoxy group expressed with R51 and R52, the thing of 1-6 has the desirable carbon number of an alkyl group part, and a methoxy group, an ethoxy radical, etc. are specifically mentioned. The alkoxy group may be permuted further.

[0036] Although the amino group expressed with R51 and R52 has a substituent also in no permuting, it is desirable to have a substituent and alkyl groups (a methyl group, ethyl group, etc.), aryl groups (phenyl group etc.), etc. are mentioned as a substituent in this case. Specifically, a diethylamino radical, a diphenylamino radical, the JI (m-tolyl) amino group, etc. are mentioned.

[0037] In a formula (A-1), respectively, p1 and p2 express the integer of 0, or 1-3, and it is especially desirable that it is 0-2. As for R51 and R52, it is desirable that p1 and p2 are a methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1-3 and.

[0038] In a formula (A-1), respectively, p3 expresses the integer of 0-3, and it is especially desirable that it is 0-2. As for R53, it is desirable that p3 is a methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1-3 and.

[0039] In a formula (A-1), when R51-R53 may be the same, or you may differ and two or more R51, R52, and R53 exist respectively, R51 comrades, R52 comrades, and R53 comrades may be respectively the same, or may differ from each other.

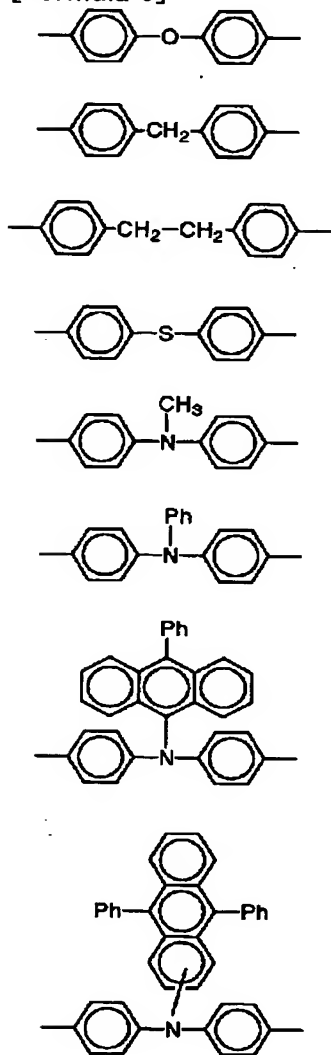
[0040] It sets at a ceremony (A-1), and is L1. Single bond or an arylene radical is expressed. L1 As an arylene radical expressed, having not permuted is desirable, and what the arylene radical beyond others, two pieces, or it specifically connected directly is mentioned.

[radicals /, such as a phenylene group, a biphenylene radical and anthrylene group, / usual / arylene] L1 If it carries out, a single bond, p-phenylene group, 4, and 4'-biphenylene radical etc. is desirable.

[0041] Moreover, L1 An alkylene group, -O-, -S-, or -NR- may intervene, and two pieces thru/or the arylene radical beyond it may connect the arylene radical expressed. Here, R expresses an alkyl group or an aryl group. A methyl group, an ethyl group, etc. are mentioned as an alkyl group, and a phenyl group etc. is mentioned as an aryl group. A1 besides the above-mentioned phenyl group with an aryl group desirable especially, and A2 you may be — further — a phenyl group — A1 Or A2 You may permute. Moreover, as an alkylene group, a methylene group, ethylene, etc. are desirable. The example of such an arylene radical is shown below.

[0042]

[Formula 9]



[0043] Next, R51 or R52 if a formula (A-2) is explained, [in / on a formula (A-2) and / in R54 / a formula (A-1)] Moreover, for R55, R53 and p4 in a formula (A-1) are [p1 or p2 in a formula (A-1), and] L2 further. It is synonymous with L1 in a formula (A-1) respectively, and the same is said of a desirable thing.

[0044] Moreover, in a formula (A-2), respectively, p5 expresses the integer of 0-4, and it is desirable [5] especially that it is 0-2. As for R55, it is desirable that p5 is a methyl group and a phenyl group respectively when it is especially 1 or 2, the integer of 1-3 and.

[0045] In a formula (A-2), when R54 and R55 may be the same, or you may differ and two or more R54 and R55 exist respectively, R54 comrades and R55 comrades may be respectively the same, or may differ from each other.

[0046] It sets at a ceremony (A-1), and is Ar1. And Ar2 On the other hand, it is Ar3 at least. And Ar4 It is desirable that at least one side is a phenyl group, a biphenyl radical, a terphenyl

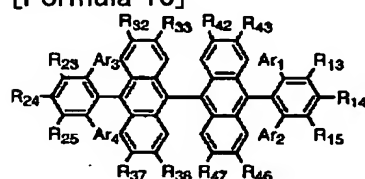
radical, a styryl radical, a phenyl styryl radical, a diphenyl styryl radical, a thienyl group, a methyl thienyl group, a phenyl thienyl group, or a FENI ruby thienyl group. Furthermore, it is Ar1. And Ar2 On the other hand, it is Ar3 at least. And Ar4 At least one side is a phenyl group, a biphenyl radical, or a terphenyl radical, and it is L1. It is desirable that it is single bond.

[0047] It sets at a ceremony (A-2), and is Ar5. And Ar6 It is desirable that at least one side is a phenyl group, a biphenyl radical, a terphenyl radical, a styryl radical, a phenyl styryl radical, a diphenyl styryl radical, a thienyl group, a methyl thienyl group, a phenyl thienyl group, or a FENI ruby thienyl group. Furthermore, it is Ar5. And Ar6 At least one side is a phenyl group, a biphenyl radical, or a terphenyl radical, and it is L2. It is desirable that it is single bond.

[0048] Although the compound expressed with a formula (A-1) and a formula (A-2) is illustrated below, this invention is not limited to these. When the combination of a formula and a radical shows here and R32-37 grade shows collectively, only a substituent shall be shown and -H shows altogether at the time of a hydrogen atom. Moreover, a cable address shall be shown timely (in addition, Toly is a tolyl group).







[0049]

[Formula 10]









[0050]

[Formula 11]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
1-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
1-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
1-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
1-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
1-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
1-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
1-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
1-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
1-15	-Ph	-H	-Ph	-H	-H	-N(Toly) ₂	-H	-H	-N(Toly) ₂	-H	-H	-H
1-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
1-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H

[0051]

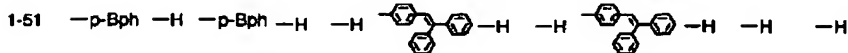
[Formula 12]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-18	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-19	-Ph	-Ph	-Ph	-Ph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-20	-Ph	-Ph	-Ph	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-21	-Ph	-Ph	-Ph	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-22	-Ph	-Ph	-Ph	-Ph	-Me	-H	-H	-Me	-H	-H	-H	-H
1-23	-Ph	-Ph	-Ph	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H
1-24	-Ph	-Ph	-Ph	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H
1-25	-Ph	-Ph	-Ph	-Ph	-H	-OPh	-H	-H	-OPh	-H	-H	-H
1-26	-Ph	-Ph	-Ph	-Ph	-H	-OMe	-H	-H	-OMe	-H	-H	-H
1-27	-Ph	-Ph	-Ph	-Ph	-H		-H		-H	-H	-H	-H
1-28	-Ph	-Ph	-Ph	-Ph	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
1-29	-Ph	-Ph	-Ph	-Ph	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
1-30	-Ph	-Ph	-Ph	-Ph	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-31	-Ph	-Ph	-Ph	-Ph	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
1-32	-Ph	-Ph	-Ph	-Ph	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
1-33	-Ph	-Ph	-Ph	-Ph	-H		-H	-H		-H	-H	-H
1-34	-Ph	-Ph	-Ph	-Ph	-H		-H	-H		-H	-H	-H

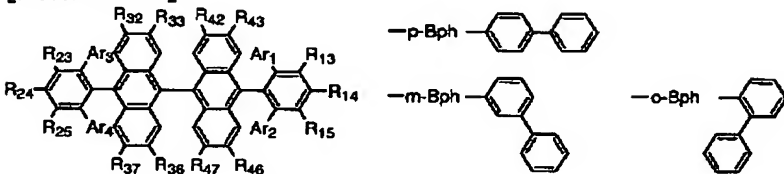
[0052]

[Formula 13]





No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-35	-p-Bph	-H	-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-36	-p-Bph	-H	-p-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-37	-p-Bph	-H	-p-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-38	-p-Bph	-H	-p-Bph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-39	-m-Bph	-H	-m-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-40	-m-Bph	-H	-m-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-41	-m-Bph	-H	-m-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-42	-m-Bph	-H	-m-Bph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-43	-o-Bph	-H	-o-Bph	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-44	-o-Bph	-H	-o-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-45	-o-Bph	-H	-o-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-46	-o-Bph	-H	-o-Bph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-47	-p-Bph	-H	-p-Bph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-48	-p-Bph	-H	-p-Bph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H



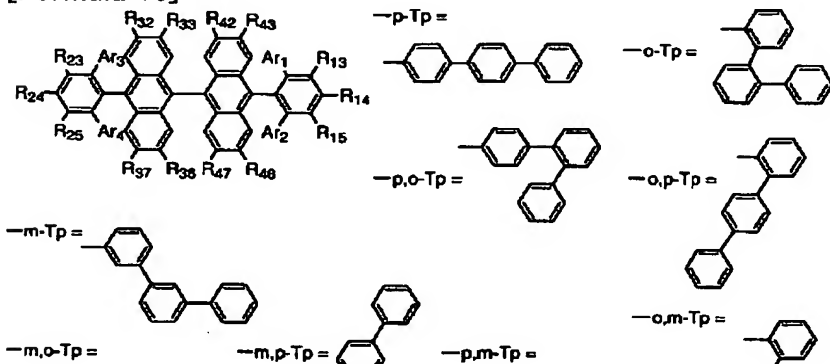
[Formula 14]

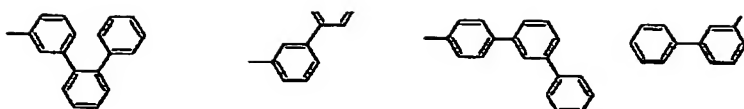


[Formula 15]

No.	R ₁	R ₂	R ₃	R ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-52	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-53	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-54	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-55	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-56	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-57	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-58	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-59	-m-Bph	-m-Bph	-m-Bph	-m-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-60	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-61	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-62	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-63	-o-Bph	-o-Bph	-o-Bph	-o-Bph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-64	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
1-65	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
1-66	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
1-67	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H		-H	-H		-H	-H	-H
1-68	-p-Bph	-p-Bph	-p-Bph	-p-Bph	-H		-H	-H		-H	-H	-H

[Formula 16]





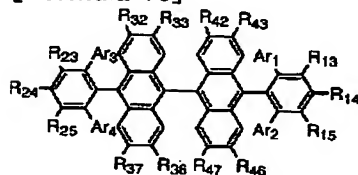
[0056]

[Formula 17]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-69	-p-Tp	-p-Tp	-p-Tp	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-70	-p-Tp	-H	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-71	-p-Tp	-H	-p-Tp	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-72	-p-Tp	-H	-p-Tp	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-73	-p-Tp	-H	-p-Tp	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-74	-p-Tp	-CH ₃	-p-Tp	-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-75	-m-Tp	-m-Tp	-m-Tp	-p-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-76	-m-Tp	-H	-m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-77	-o-Tp	-o-Tp	-o-Tp	-o-Tp	-H	-H	-H	-H	-H	-H	-H	-H
1-78	-o-Tp	-H	-o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-79	-p,o-Tp	-H	-p,o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-80	-o,p-Tp	-H	-o,p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-81	-p,m-Tp	-H	-p,m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-82	-m,p-Tp	-H	-m,p-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-83	-m,o-Tp	-H	-m,o-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-84	-o,m-Tp	-H	-o,m-Tp	-H	-H	-H	-H	-H	-H	-H	-H	-H

[0057]

[Formula 18]



[0058]

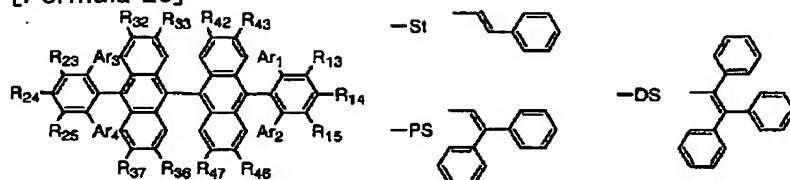
[Formula 19]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-85	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₄₃ =Ph	R ₄₃ =Ph
1-86	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₇ =Ph R ₄₅ =Ph	R ₄₃ =Ph R ₄₆ =Ph
1-87	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₆ =Ph R ₄₇ =Ph	R ₄₃ =Ph R ₄₇ =Ph
1-88	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph	R ₄₃ =Ph
1-89	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₇ =Ph	R ₄₃ =Ph R ₄₆ =Ph
1-90	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Ph R ₃₆ =Ph	R ₄₃ =Ph R ₄₇ =Ph
1-91	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
1-92	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₇ =Me	R ₄₃ =Me R ₄₆ =Me
1-93	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	R ₃₂ =Me R ₃₆ =Me	R ₄₃ =Me R ₄₇ =Me

1-94	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
1-95	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
											R ₃₇ =Me	R ₄₆ =Me
1-96	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H	-H	-H	R ₃₂ =Me	R ₄₃ =Me
											R ₃₆ =Me	R ₄₇ =Me

[0059]

[Formula 20]



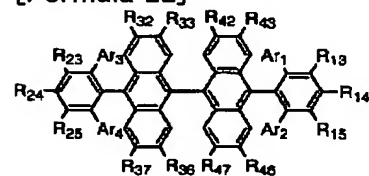
[0060]

[Formula 21]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-97	-St	-H	-St	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-98	-St	-H	-St	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-99	-St	-H	-St	-H	-H	-Ph	-H	-H	-Ph	-Ph	-H	-H
1-100	-St	-H	-St	-H	-H	-H	-Ph	-H	-H	-H	-H	-H
1-101	-St	-St	-St	-St	-H	-H	-H	-H	-H	-H	-H	-H
1-102	-St	-St	-St	-St	-Ph	-H	-H	-Ph	-H	-H	-H	-H
1-103	-St	-St	-St	-St	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-104	-St	-St	-St	-St	-H	-H	-Ph	-H	-H	-Ph	-H	-H
1-105	-St	-H	-St	-H	-H	-St	-H	-H	-H	-St	-H	-H
1-106	-St	-St	-St	-St	-H	-St	-H	-H	-St	-H	-H	-H
1-107	-PS	-H	-PS	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-108	-PS	-PS	-PS	-PS	-H	-H	-H	-H	-H	-H	-H	-H
1-109	-PS	-H	-PS	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-110	-DS	-H	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H
1-111	-DS	-DS	-DS	-DS	-H	-H	-H	-H	-H	-H	-H	-H
1-112	-DS	-H	-DS	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H

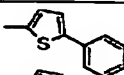
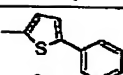
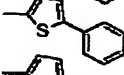
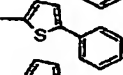
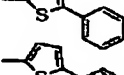
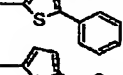
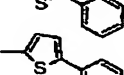
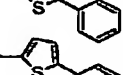
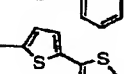
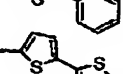
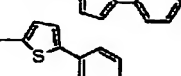
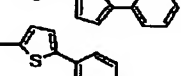
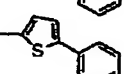
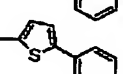




[0061]

[Formula 22]



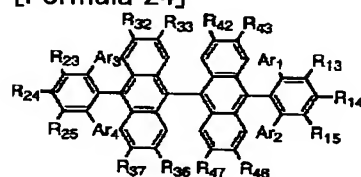
[0062]

[Formula 23]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-113		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-114		-Ph		-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-115		-CH ₃		-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-116		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-117		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-118		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-119		-H		-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-120					-H	-H	-H	-H	-H	-H	-H	-H

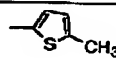
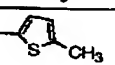
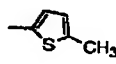
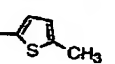
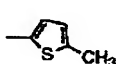

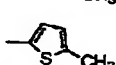
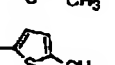
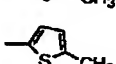
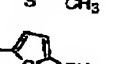
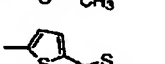
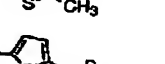


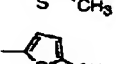

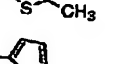

[0063]

[Formula 24]



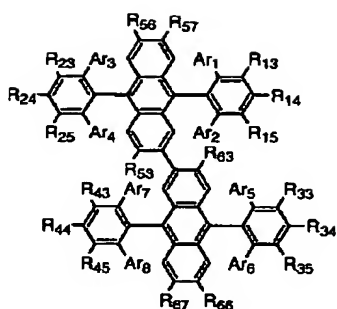
[0064]

[Formula 25]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
1-121		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-122		-Ph		-Ph	-H	-H	-H	-H	-H	-H	-H	-H
1-123		-CH ₃		-CH ₃	-H	-H	-H	-H	-H	-H	-H	-H
1-124		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-125		-p-Bph		-p-Bph	-H	-H	-H	-H	-H	-H	-H	-H
1-126		-H		-H	-H	-H	-H	-H	-H	-H	-H	-H
1-127		-H		-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
1-128					-H	-H	-H	-H	-H	-H	-H	-H

[0065]

[Formula 26]



[0066]

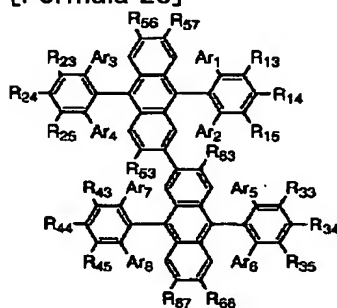
[Formula 27]

上記式中のAr₁～Ar₈ (次頁に続く)

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	Ar ₅	Ar ₆	Ar ₇	Ar ₈
2-1	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-2	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph
2-3	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-4	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph	—Ph
2-5	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-6	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-7	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-8	—Ph	—CH ₃	—Ph	—CH ₃	—Ph	—CH ₃	—Ph	—CH ₃
2-9	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-10	—Ph	—H	—Ph	—H	—Ph	—H	—Ph	—H
2-11	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H
2-12	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph
2-13	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H
2-14	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph	—p-Bph
2-15	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H
2-16	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H	—p-Bph	—H
2-17	—m-Bph	—H	—m-Bph	—H	—m-Bph	—H	—m-Bph	—H
2-18	—m-Bph	—m-Bph	—m-Bph	—m-Bph	—m-Bph	—m-Bph	—m-Bph	—m-Bph
2-19	—o-Bph	—H	—o-Bph	—H	—o-Bph	—H	—o-Bph	—H
2-20	—o-Bph	—o-Bph	—o-Bph	—o-Bph	—o-Bph	—o-Bph	—o-Bph	—o-Bph

[0067]

[Formula 28]



[0068]

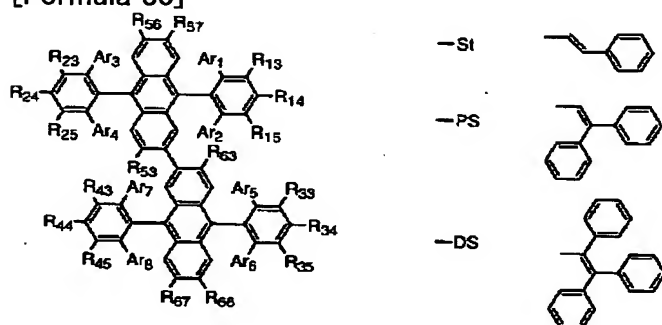
[Formula 29]

上記式中のR₁₃~R₁₅等（前頁の続き）

No.	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₃	R ₃₄	R ₃₅	R ₄₃	R ₄₄	R ₄₅	R ₅₆₋₅₇	R ₆₆₋₆₇
2-1	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-2	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-3	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-4	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-5	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
2-6	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2-7	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-CH ₃	-H	-H	-H
2-8	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-9	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph	R ₆₆ =Ph
2-10	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	R ₅₆ =Ph R ₅₇ =Ph	R ₆₆ =Ph R ₆₇ =Ph
2-11	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-12	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-13	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-14	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-15	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H
2-16	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2-17	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-18	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-19	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-20	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H

[0069]

[Formula 30]



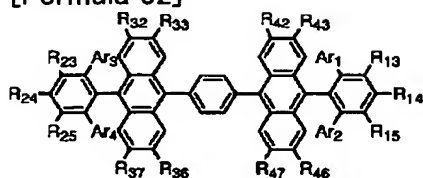
[0070]

[Formula 31]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	Ar ₅	Ar ₆	Ar ₇	Ar ₈	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₃	R ₃₄	R ₃₅	R ₄₃	R ₄₄	R ₄₅	R ₅₆₋₅₇	R ₆₆
2-21	-Si	-H	-Si	-H	-Si	-H	-Si	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-22	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-23	-Si	-H	-Si	-H	-Si	-H	-Si	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-24	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
2-25	-PS	-H	-PS	-H	-PS	-H	-PS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-26	-PS	-PS	-PS	-H	-PS	-PS	-PS	-PS	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-27	-DS	-H	-DS	-H	-DS	-H	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-28	-DS	-DS	-DS	-DS	-DS	-DS	-DS	-DS	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-29	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-Si	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H
2-30	-Si	-H	-Si	-H	-Si	-H	-Si	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H	-H

[0071]

[Formula 32]



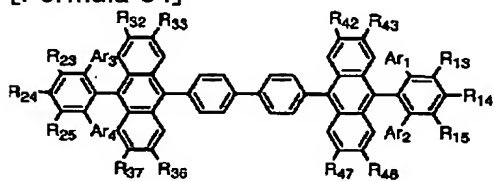
[0072]

[Formula 33]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
3-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
3-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
3-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
3-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
3-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
3-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
3-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
3-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
3-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
3-10	-Ph	-H	-Ph	-H	-H		-H		-H	-H	-H	-H
3-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
3-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
3-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
3-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
3-15	-Ph	-H	-Ph	-H	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
3-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
3-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H







[0073]

[Formula 34]



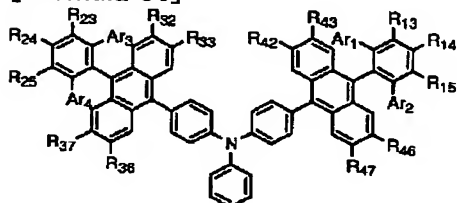
[0074]

[Formula 35]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
4-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
4-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
4-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
4-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
4-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
4-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
4-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
4-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
4-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
4-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
4-11	-Ph	-H	-Ph	-H	-H	-p-Bph	-H	-H	-p-Bph	-H	-H	-H
4-12	-Ph	-H	-Ph	-H	-H	-m-Bph	-H	-H	-m-Bph	-H	-H	-H
4-13	-Ph	-H	-Ph	-H	-H	-o-Bph	-H	-H	-o-Bph	-H	-H	-H
4-14	-Ph	-H	-Ph	-H	-H	-NPh ₂	-H	-H	-NPh ₂	-H	-H	-H
4-15	-Ph	-H	-Ph	-H	-H	-N(Tolyl) ₂	-H	-H	-N(Tolyl) ₂	-H	-H	-H
4-16	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H
4-17	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H



[0075]





[Formula 36]



[0076]

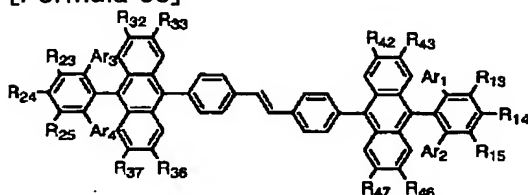
[Formula 37]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
5-1	-Ph	-H	-Ph	-H	-H	-H	-H	-H	-H	-H	-H	-H
5-2	-Ph	-H	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-H	-H
5-3	-Ph	-H	-Ph	-H	-H	-Ph	-H	-H	-Ph	-H	-H	-H
5-4	-Ph	-H	-Ph	-H	-H	-H	-Ph	-H	-H	-Ph	-H	-H
5-5	-Ph	-H	-Ph	-H	-Me	-H	-H	-Me	-H	-H	-H	-H
5-6	-Ph	-H	-Ph	-H	-H	-Me	-H	-H	-Me	-H	-H	-H
5-7	-Ph	-H	-Ph	-H	-H	-H	-Me	-H	-H	-Me	-H	-H
5-8	-Ph	-H	-Ph	-H	-H	-OPh	-H	-H	-OPh	-H	-H	-H
5-9	-Ph	-H	-Ph	-H	-H	-OMe	-H	-H	-OMe	-H	-H	-H
5-10	-Ph	-H	-Ph	-H	-H		-H	-H		-H	-H	-H

5-11	—Ph	—H	—Ph	—H	—H	—p-Bph	—H	—H	—p-Bph	—H	—H	—H
5-12	—Ph	—H	—Ph	—H	—H	—m-Bph	—H	—H	—m-Bph	—H	—H	—H
5-13	—Ph	—H	—Ph	—H	—H	—o-Bph	—H	—H	—o-Bph	—H	—H	—H
5-14	—Ph	—H	—Ph	—H	—H	—NPh ₂	—H	—H	—NPh ₂	—H	—H	—H
5-15	—Ph	—H	—Ph	—H	—H	—N(Tolyl) ₂	—H	—H	—N(Tolyl) ₂	—H	—H	—H
5-16	—Ph	—H	—Ph	—H	—H		—H	—H		—H	—H	—H
5-17	—Ph	—H	—Ph	—H	—H		—H	—H		—H	—H	—H







[0077]

[Formula 38]



[0078]

[Formula 39]

No.	Ar ₁	Ar ₂	Ar ₃	Ar ₄	R ₁₃	R ₁₄	R ₁₅	R ₂₃	R ₂₄	R ₂₅	R ₃₂₋₃₇	R ₄₂₋₄₇
6-1	—Ph	—H	—Ph	—H	—H	—H	—H	—H	—H	—H	—H	—H
6-2	—Ph	—H	—Ph	—H	—Ph	—H	—H	—Ph	—H	—H	—H	—H
6-3	—Ph	—H	—Ph	—H	—H	—Ph	—H	—H	—Ph	—H	—H	—H
6-4	—Ph	—H	—Ph	—H	—H	—H	—Ph	—H	—H	—Ph	—H	—H
6-5	—Ph	—H	—Ph	—H	—Me	—H	—H	—Me	—H	—H	—H	—H
6-6	—Ph	—H	—Ph	—H	—H	—Me	—H	—H	—Me	—H	—H	—H
6-7	—Ph	—H	—Ph	—H	—H	—H	—Me	—H	—H	—Me	—H	—H
6-8	—Ph	—H	—Ph	—H	—H	—OPh	—H	—H	—OPh	—H	—H	—H
6-9	—Ph	—H	—Ph	—H	—H	—OMe	—H	—H	—OMe	—H	—H	—H
6-10	—Ph	—H	—Ph	—H	—H		—H	—H		—H	—H	—H
6-11	—Ph	—H	—Ph	—H	—H	—p-Bph	—H	—H	—p-Bph	—H	—H	—H
6-12	—Ph	—H	—Ph	—H	—H	—m-Bph	—H	—H	—m-Bph	—H	—H	—H
6-13	—Ph	—H	—Ph	—H	—H	—o-Bph	—H	—H	—o-Bph	—H	—H	—H
6-14	—Ph	—H	—Ph	—H	—H	—NPh ₂	—H	—H	—NPh ₂	—H	—H	—H
6-15	—Ph	—H	—Ph	—H	—H	—N(Tolyl) ₂	—H	—H	—N(Tolyl) ₂	—H	—H	—H
6-16	—Ph	—H	—Ph	—H	—H		—H	—H		—H	—H	—H
6-17	—Ph	—H	—Ph	—H	—H		—H	—H		—H	—H	—H

[0079] JP,8-12600,A etc. can be referred to about the synthesis method of the phenyl anthracene derivative of this invention.

[0080] These compounds may use two or more sorts together, using only one sort.

[0081] As thickness in the case of considering as a blue luminous layer, using a phenyl

anthracene derivative as a blue luminescence compound, 1–500nm is desirable and is 10–200nm more preferably.

[0082] To such a luminous layer, a dopant may be doped in the form which can hold blue luminescence. As such a dopant, the styryl system amine compound of an indication etc. is mentioned to WO 98/No. 08360 and JP,8–239655,A. About a styryl system amine compound, it mentions later. As for the amount of the dopant used, it is desirable in a luminous layer that it is 0.1 to 20 mass %. The stability of luminous efficiency or a component improves by use of a dopant.

[0083] Moreover, a blue luminous layer may contain the electron injection transportability compound or hole impregnation transportability compound used for the electronic transportation layer adjoined and prepared in a luminous layer, and a hole transportation layer as a host ingredient. Using the phenyl anthracene derivative specifically used for the electronic transportation layer as a host ingredient etc. is mentioned. Since a phenyl anthracene derivative has a blue luminescence property, it can carry out blue luminescence by itself, but when a host ingredient is what does not have a blue luminescence property, it changes a luminescence property and it may be made to carry out blue luminescence by using a dopant. such — if a dopant is carried out, the above-mentioned styryl system amine compound etc. is mentioned.

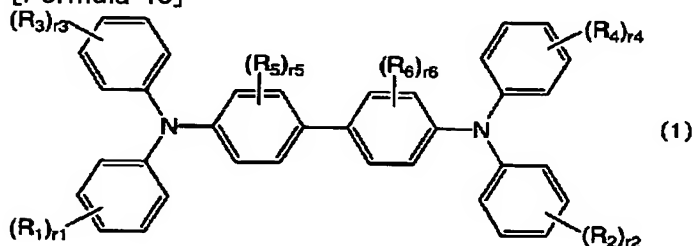
[0084] It is desirable to make the thickness ratio of the electronic transportation layer or hole transportation layer which contains the compound used as a host ingredient with such a configuration, and a luminous layer luminous layer thickness / electronic transportation layer, or hole transportation thickness set to 1 / 100 – 100/1.

[0085] Moreover, a blue luminous layer may be a mixolimnion of an electron injection transportability compound and a hole impregnation transportability compound, and such a mode is desirable. Especially, the same thing as the compound used for the electronic transportation layer adjoined and prepared in a luminous layer and the hole transportation layer of either compound of an electron injection transportability compound and a hole impregnation transportability compound is desirable. It is adjoining a luminous layer, preparing an electronic transportation layer and a hole transportation layer preferably, and considering as the mixture of these compounds using the electron injection transportability compound in these layers, and a hole impregnation transportability compound especially.

[0086] Specifically, it is desirable to use the third class amine of aromatic series in a hole transportation layer as a hole impregnation transportability compound, using the phenyl anthracene derivative in an electronic transportation layer as an electron injection transportability compound. The compound of the above-mentioned formula (A) is desirable as a phenyl anthracene derivative. As the third class amine of aromatic series, the tetra-aryl benzidine derivative expressed with a formula (1) is desirable.

[0087]

[Formula 40]



[0088] It is R1 –R4 when a formula (1) is explained. An aryl group, an alkyl group, an alkoxy group, an aryloxy group, or a halogen radical is expressed, respectively, and these may be the same or may differ. When r1–r4 are the integers of 0–5, respectively and r1–r4 are two or more integers, respectively, it may join together mutually, respectively and R1 adjoining comrades, R2 comrades, R3 comrades, and R4 comrades may form a ring. R5 And R6 An alkyl group, an alkoxy group, the amino group, or a halogen radical is expressed, respectively, and these may be the same or may differ. r5 and r6 are the integers of 0–4, respectively.

[0089] R1 -R4 As an aryl group expressed, you may be the thing of a monocycle or many rings, and the condensed ring and a ring set are also included. The number of total carbon may have the desirable thing of 6-20, and you may have the substituent. As a substituent in this case, an alkyl group, an alkoxy group, an aryl group, an aryloxy group, the amino group, a halogen atom, etc. are mentioned. Specifically a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, a naphthyl group, an anthryl radical, a biphenyl radical, a phenyl anthryl radical, a tolyl anthryl radical, etc. are mentioned, especially a phenyl group is desirable, and, as for the joint location of an aryl group, especially a phenyl group, it is desirable that it is the 3rd place (it is the meta position to the joint location of N) or the 4th place (it is the para position to the joint location of N).

[0090] R1 -R4 As an alkyl group expressed, also by the shape of a straight chain, you may have branching, and the thing of carbon numbers 1-10 may be desirable, and may have the substituent. The thing same as a substituent in this case as an aryl group is mentioned. Specifically, a methyl group, an ethyl group, a propyl group (n-, i-), butyl (n-, i-, s-, t-), etc. are mentioned.

[0091] R1 -R4 As an alkoxy group expressed, the thing of the carbon numbers 1-6 of an alkyl part is desirable, and a methoxy group, an ethoxy radical, a t-butoxy radical, etc. are specifically mentioned. The alkoxy group may be permuted further.

[0092] R1 -R4 As an aryloxy group expressed, a phenoxy group, 4-methylphenoxy radical, 4-(t-butyl) phenoxy group, etc. are mentioned.

[0093] R1 -R4 A chlorine atom, a bromine atom, etc. are mentioned as a halogen radical expressed.

[0094] Also in a formula (1), as a desirable mode, either r1-r4 are two or more integers, and the case where R1 comrades, R2 comrades, R3 comrades, or R4 comrades join together mutually, and it forms a ring (for example, benzene ring) is mentioned.

[0095] Moreover, as another desirable mode, it is R1 -R4. At least one piece is the case where it is an aryl group. That is, r1-r4 are not set to 0 to coincidence. Therefore, $r1+r2+r3+r4$ are one or more integers, and they are a number which fulfills the conditions in which at least one aryl group exists.

[0096] R1 -R4 As for at least one piece, it is desirable that 2-4 aryl groups exist in 1 molecule as R1 -R4 especially when it is an aryl group, and it is desirable that 2-4 in r1-r4 are one or more integers. Especially an aryl group is R1 -R4 which it exists with 2-4 grand totals in a molecule, 2-4 in r1-r4 are 1 preferably, and r1-r4 are 1 still more preferably, and is contained. It is desirable that all are also aryl groups. Namely, R1 -R4 in a molecule Although you may combine with a different thing even if 2-4 aryl groups existed in the four benzene rings which may be permuted with the grand total and it has combined 2-4 aryl groups with the same thing in the four benzene rings, it is desirable to have combined with the benzene ring from which 2-4 aryl groups differ especially, respectively. And it is more desirable that at least two aryl groups have combined with the para position or the meta position to the joint location of N further. Moreover, it is desirable that at least one piece is a phenyl group as an aryl group in this case, namely, it is desirable for an aryl group and the benzene ring to become together and to form 4- or 3-biphenyl radical to N atom. It is especially desirable that 2-4 pieces are 4- or 3-biphenyl radical. As for 4- or 3-biphenyl radical, one side both may be intermingled. Moreover, especially (1-, 2-) as aryl groups other than a phenyl group, a naphthyl group, an anthryl (1-, 2-, 9-) radical, a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, etc. are desirable, and it is desirable to also combine aryl groups other than a phenyl group with the para position or the meta position to the joint location of N. These aryl groups may also be intermingled with the phenyl group.

[0097] It sets at a ceremony (1) and is R5 and R6. As the alkyl group and alkoxy group which are expressed, and a halogen atom, it is R1 -R4. What was mentioned by the way, and the same thing are mentioned.

[0098] R5 and R6 As an amino group expressed Although it has a substituent also in no permuting, what has a substituent is desirable. Specifically A dimethylamino radical, a diethylamino radical, a diphenylamino radical, A ditolylamino radical, the JIBIFENIRIRU amino

group, an N-phenyl-N-tolylamino radical, The N-phenyl-N-naphthyl amino group, the N-phenyl-N-biphenyl amino group, the N-phenyl-N-anthryl amino group, the N-phenyl-N-pyrenyl amino group, a dinaphthylamino radical, a JIAN tolylamino radical, the JIPIRE nil amino group, etc. are mentioned.

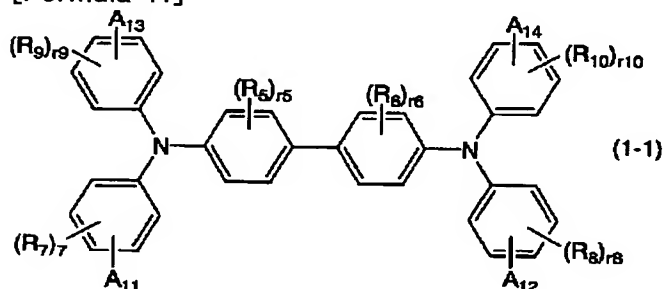
[0099] As for both r_5 and r_6 , it is desirable that it is 0, and the biphenylene radical which connects two arylamino radicals has a desirable non-permuted thing.

[0100] in addition, the time of r_1 - r_4 being two or more integers — each R — 1 -R4 comrades — each — it may be the same or you may differ. Moreover, it is R5 when r_5 and r_6 are two or more integers. Comrades and R6 comrades may be the same, or may differ from each other.

[0101] Also in these compounds, the compound expressed with the following type (1-1) is desirable.

[0102]

[Formula 41]



[0103] When a formula (1-1) is explained, A11-A14 express the phenyl group or hydrogen atom combined with the para position (the 4th place) or the meta position (the 3rd place) to the joint location of N, respectively, and these may be the same or may differ. However, as for two or more pieces, A11-A14, it is desirable that it is a phenyl group. These phenyl groups may have the substituent further and are R1 -R4 as a substituent in this case. The same thing as the substituent which the aryl group expressed mentioned by the way can be mentioned.

[0104] R7 -R10 express an alkyl group, an alkoxy group, an aryl group, an aryloxy group, or a halogen radical, respectively, and these may be the same or may differ. As these examples, it is R1 -R4 of a formula (1). What was mentioned by the way, and the same thing can be mentioned.

[0105] r_7 - r_{10} are the integers of 0-4, respectively, and, as for r_7 - r_{10} , it is desirable that it is 0.

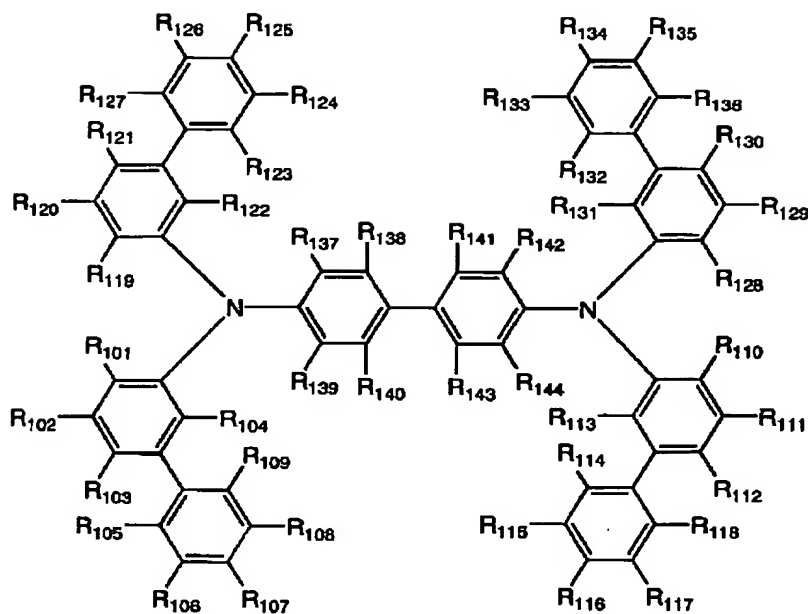
[0106] in addition, the time of r_7 - r_{10} being two or more each integers — every — R7 - R10 comrades may be the same, or may differ.

[0107] Moreover, in a formula (1-1), R5, R6, and r_5 and r_6 are synonymous with the thing of a formula (1), and it is desirable that it is $r_5=r_6=0$.

[0108] Although the example of a compound expressed with a formula (1) is shown below, this invention is not limited to this. The example is shown according to the display of a formula (I) and (II), and only the substituent is shown, when H shows at the time of H and a substituent exists altogether in R1 - R4 grade. In addition, N of use, N'-JI (1-naphthyl)-N, and an N'-diphenyl benzidine can be illustrated in the example.

[0109]

[Formula 42]



(I)

[0110]

[Formula 43]

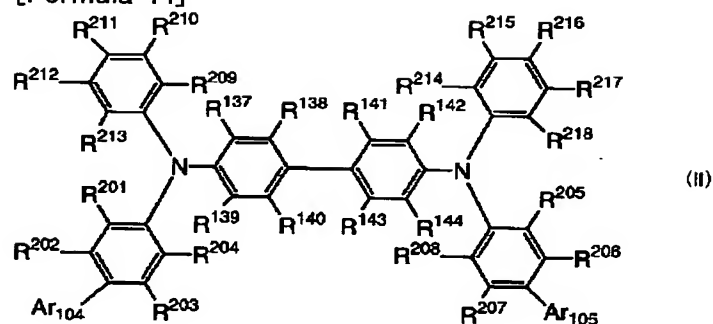
化43

R_{113}	$R_{114} \sim R_{118}$	$R_{119} \sim R_{122}$	$R_{123} \sim R_{127}$	$R_{128} \sim R_{131}$	$R_{132} \sim R_{136}$	$R_{137} \sim R_{144}$
H	H	H	H	H	H	H
$R_{117} = CH_3$		$R_{128} = CH_3$	$R_{128} = CH_3$	$R_{135} = CH_3$		H
$R_{116} = CH_3$		$R_{125} = CH_3$	$R_{125} = CH_3$	$R_{134} = CH_3$		H
$R_{116} = Ph$		$R_{125} = Ph$	$R_{125} = Ph$	$R_{134} = Ph$		H
$R_{116} = OPh$		$R_{125} = OPh$	$R_{125} = OPh$	$R_{134} = OPh$		H
$R_{116} = N(C_2H_5)_2$		$R_{125} = N(C_2H_5)_2$	$R_{125} = N(C_2H_5)_2$	$R_{134} = N(C_2H_5)_2$		H
H	$R_{120} = Ph$	H	H	$R_{129} = Ph$	H	H
H	$R_{120} = OPh$	H	H	$R_{129} = OPh$	H	H
H	H	H	H	H	$R_{137} = R_{142} = CH_3$	
H	H	H	H	H	$R_{140} = R_{143} = CH_3$	
$R_{116} = Ph$	$R_{120} = Ph$	$R_{125} = Ph$	$R_{125} = Ph$	$R_{129} = Ph$	$R_{134} = Ph$	H
$R_{116} = CH_3$	H	$R_{125} = CH_3$	$R_{125} = CH_3$	H	$R_{134} = CH_3$	H
$R_{117} = Ph$	H	$R_{125} = Ph$	$R_{125} = Ph$	H	$R_{135} = Ph$	H

化合物 No.	$R_{101} \sim R_{104}$	$R_{105} \sim R_{109}$	$R_{110} \sim R_{111}$
I-1	H	H	H
I-2	H	$R_{106} = \text{CH}_3$	H
I-3	H	$R_{107} = \text{CH}_3$	H
I-4	H	$R_{107} = \text{Ph}$	H
I-5	H	$R_{107} = \text{OPh}$	H
I-6	H	$R_{107} = \text{N}(\text{C}_2\text{H}_5)_2$	H
I-7	$R_{102} = \text{Ph}$	H	$R_{111} = \text{Pt}$
I-8	$R_{102} = \text{OPh}$	H	$R_{111} = \text{O}$
I-9	H	H	H
I-10	H	H	H
I-11	$R_{102} = \text{Ph}$	$R_{107} = \text{Ph}$	$R_{111} = \text{Pt}$
I-12	H	$R_{106} = \text{CH}_3$	H
I-13	H	$R_{106} = \text{Ph}$	H

[0111]

[Formula 44]



[0112]

[Formula 45]

R_{105}	$R_{201} \sim R_{204}$	$R_{205} \sim R_{208}$	$R_{209} \sim R_{213}$	$R_{214} \sim R_{218}$	$R_{137} \sim R_{144}$
$-\text{N}(\text{Ph})_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H
$-\text{I} \left(\text{C}_6\text{H}_4 \right)_2$	H	H	H	H	H

化合物 No.	Ar ₁₀₄	A
105-1		
105-2		
105-3		
105-4		
105-5		
105-6		
105-7		
105-8		

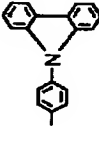
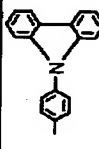
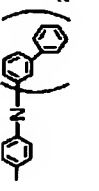
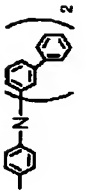
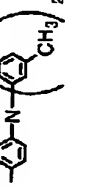
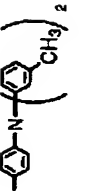
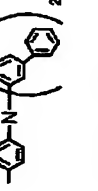
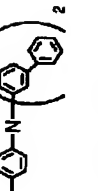
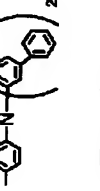
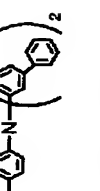


[0113]

[Formula 46]

化合物 No.	Ar ₁₀₄	Ar ₁₀₅	R ²⁰¹ ~R ²⁰⁴	R ²⁰⁵ ~R ²⁰⁸	R ²⁰⁹ ~R ²¹³	R ²¹⁴ ~R ²¹⁸	R ¹³⁷ ~R ¹⁴⁴
105-9			H	H	H	H	H
105-10			H	H	H	H	H
105-11			H	H	H	H	H
105-12			H	H	H	H	H
105-13			H	H	H	H	H

[0114]

[Formula 47]

化合物 No.	Ar ₁₀₄	Ar ₁₀₅	R ²⁰¹ ~R ²⁰⁴	R ²⁰⁵ ~R ²⁰⁸	R ²⁰⁹ ~R ²¹³	R ²¹⁴ ~R ²¹⁸	R ¹³⁷ ~R ¹⁴⁴
105-14			H	H	H	H	H
105-15			H	H	H	H	R ¹³⁷ =R ¹⁴² =CH ₃
105-16			H	H	H	H	R ¹³⁷ =R ¹⁴² =CH ₃
105-17			H	H	R ²¹¹ =Ph	R ²¹⁶ =Ph	H
105-18			H	H	R ²¹² =Ph	R ²¹⁷ =Ph	H
105-19			H	H	R ²¹³ =Ph	R ²¹⁸ =Ph	H

[0115] One sort of tetra-aryl benzidine derivatives expressed with a formula (1) may be used, or may be used together two or more sorts.

[0116] It is desirable still more desirable that an electron injection transportability compound / hole impregnation transportability compound is 10 / 90 – 90/10, and the mixing ratios (volume ratio) of the electron injection transportability compound and hole impregnation transportability compound in a mixolimnion are 20 / 80 – 80/20.

[0117] In such a mixolimnion, when using the above-mentioned phenyl anthracene derivative for an electronic transportability compound, this self can be used as a blue luminescence compound. Thus, when using a phenyl anthracene derivative as a blue luminescence compound, mixing with a tetra-aryl benzidine derivative and considering as a blue luminous layer, as for a phenyl anthracene derivative / tetra-aryl benzidine derivative (volume ratio), 95 / 5 – 30/70 are desirable, and 90 / 10 – 40/60 are more desirable.

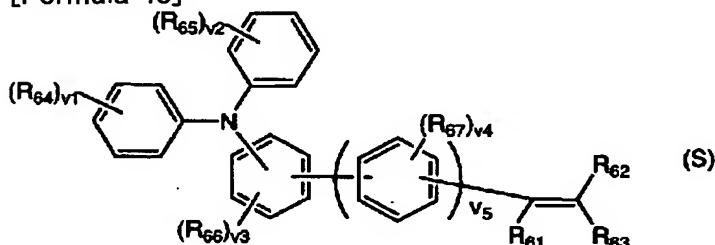
[0118] Moreover, in the above mixolimnions, a dopant may be doped further and the dope of a

dopant is desirable in respect of the improvement in luminous efficiency, and the stability of a component. As for the amount of the dopant used, it is desirable in a mixture that it is 0.1 to 20 mass %.

[0119] As such a dopant, the above-mentioned styryl system amine compound is used preferably. The compound expressed especially with a formula (S) is desirable.

[0120]

[Formula 48]



[0121] When a formula (S) is explained, R61 expresses hydrogen or an aryl group among a formula (S). As an aryl group expressed with R61, you may have a substituent, and a thing with 6–30 total carbon is desirable, for example, a phenyl group etc. is mentioned.

[0122] R62 and R63 express hydrogen, an aryl group, or an alkenyl radical respectively, and these may be the same or may differ.

[0123] As an aryl group expressed with R62 and R63, you may have a substituent, and a thing with 6–70 total carbon is desirable. A phenyl group, a naphthyl group, an anthryl radical, etc. are specifically mentioned, and an arylamino radical (for example, diphenylamino radical), an arylamino aryl group, etc. are desirable as a substituent. moreover, the radicals of the monovalence guided from the compound in which it is also desirable that a styryl radical (the styryl radical may have substituents, such as a phenyl group, a diphenylamino radical, a naphthyl (phenyl) amino group, and a diphenyl aminophenyl radical, further.) is contained in such a substituent, and it is shown by the formula (S) in such a case — itself — or it is desirable that it is also the structure which was combined through the connection radical.

[0124] You may be what has a substituent as an alkenyl radical expressed with R62 and R63. A thing with 2–50 total carbon is desirable, and it is desirable for a vinyl group etc. to be mentioned and to form the styryl radical with the vinyl group. The styryl radical may have substituents, such as an arylamino aryl group (for example, diphenyl aminophenyl radical) and an arylamino radical (for example, diphenylamino radical). In such a case, it is desirable that it is also the structure which the radicals of the monovalence guided from the compound shown by the formula (S) are itself, or they combined through the connection radical.

[0125] the radicals of the monovalence same and guided [R64 and R65 may express an arylamino radical or an arylamino aryl group, and may contain the styryl radical (the styryl radical may have substituents, such as a phenyl group, further.) in these, and] from the compound shown by the formula (S) in such a case, — itself — or it is desirable that it is also the structure which was combined through the connection radical.

[0126] v1 and v2 express the integer of 0–5, and when v1 and v2 are two or more, R64 comrades and R65 comrades may join together mutually, and they may form the condensed rings, such as the benzene ring.

[0127] R66 and R67 express an alkyl group and an aryl group respectively. As an alkyl group expressed with R66 and R67, also by the shape of a straight chain, you may have the substituent, and you may have branching, and a thing with 1–6 total carbon is desirable, and a methyl group, an ethyl group, etc. are specifically mentioned. As an aryl group expressed with R66 and R67, you may have the substituent, and monocycles may also be many rings, a thing with 6–20 total carbon is desirable, and a phenyl group etc. is specifically mentioned.

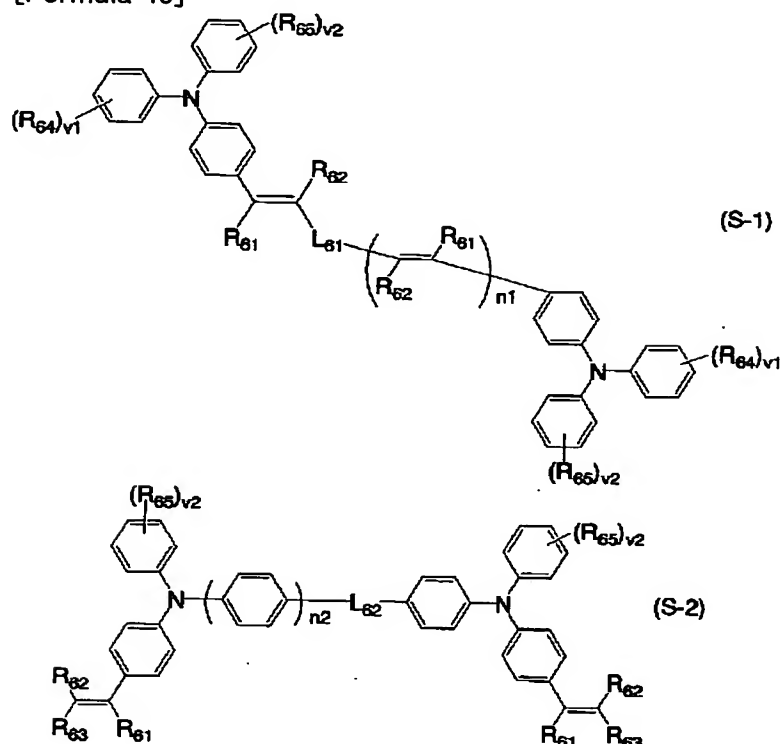
[0128] v3 and v4 express the integer of 0–4.

[0129] v5 expresses 0 or 1. The structure combined so that the diphenylamino radical which v5 is 0 and R64 and R65 may combine, and the vinyl group which R61, R62, and R63 combined might serve as the para position to a phenylene group also in a formula (S) is desirable.

[0130] The compound especially expressed with the following type (S-1) and (S-2) is desirable.

[0131]

[Formula 49]



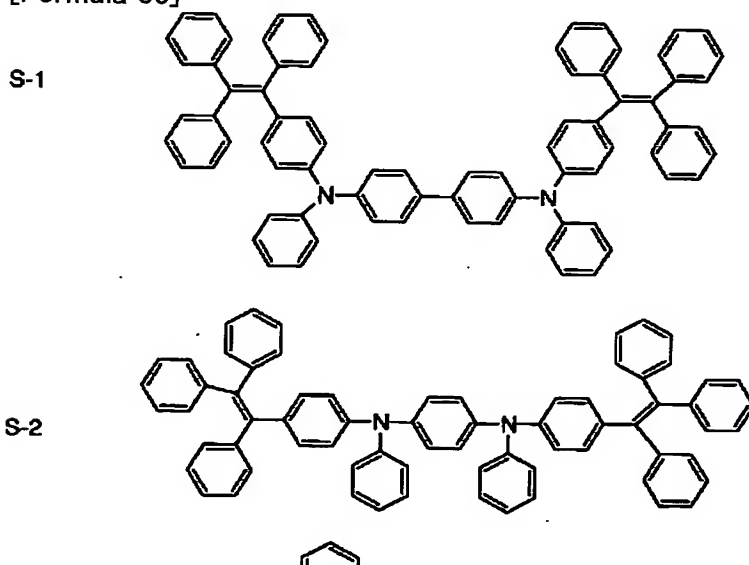
[0132] R61, R62, R64, R65, v1, and v2 are a thing in a formula (S), and the thing of homonymy among a formula (S-1), n1 expresses 0 or 1 and L61 expresses a joint hand or an arylene radical. As a desirable example of an arylene radical, a phenylene group, a biphenylene radical, a naphthylene radical, anthrylene group, etc. are mentioned, and these combination may also be desirable and, as for these radicals, you may have the substituent further.

[0133] R61–R63, and R65 and v2 are a thing in a formula (S), and the thing of homonymy among a formula (S-2), and n2 expresses 0 or 1 and L62 is synonymous with L61 in a formula (S-1).

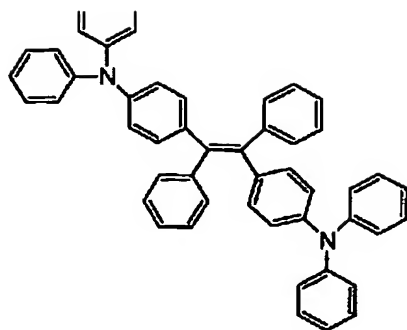
[0134] The example of the styryl system amine compound of a formula (S) is shown below.

[0135]

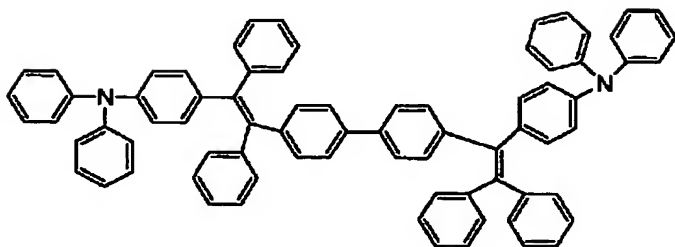
[Formula 50]



S-3



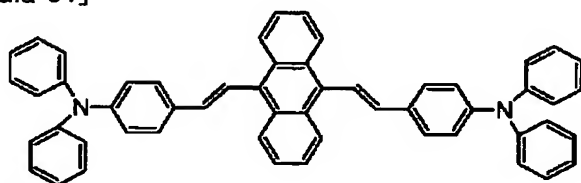
S-4



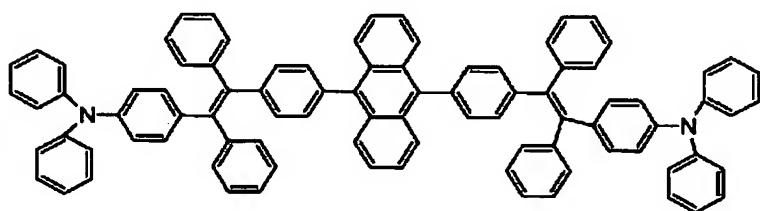
[0136]

[Formula 51]

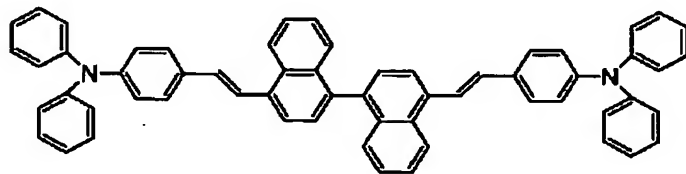
S-5



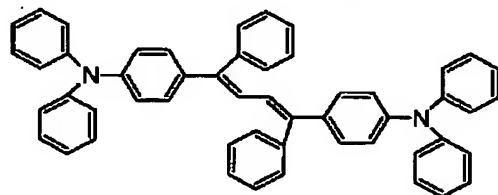
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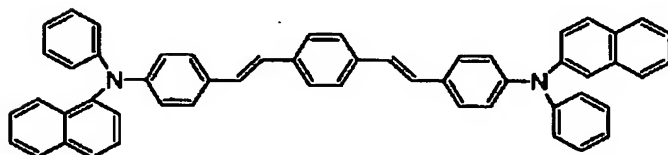
S-7



S-8



S-9



[0137] One sort of these compounds may be used or they may be used together two or more sorts.

[0138] In the above mixolimnions, it is desirable to choose an electron injection

transportability compound and a hole impregnation transportability compound so that the product of whenever [charge transfer] and the density of electric charge may become almost equal. The still more desirable aforementioned conditions are fulfilled and it is desirable that also whenever [charge transfer] is almost equal. In this case, as for whenever [charge transfer], it is desirable that it asks by the time OBUFU light method etc., and is in the range of $1 \times 10^{-1} - 1 \times 10^{-5} \text{cm}^2/\text{V}\cdot\text{s}$. Thus, as whenever [charge transfer] becomes near, ***** of a carrier decreases from that raising the recombination probability of i carrier by choosing a compound raises luminous efficiency, and ii luminous layer, the damage of a carrier transportation layer becomes small, and there is an advantage which can carry out reinforcement of the luminescence life of a component. Moreover, by mixing a hole impregnation transportability compound and an electron injection transportability compound, the mobility of each electron and a hole falls and there is also an advantage of recombination probability improving.

[0139] You may be mixing to homogeneity and an electron injection transportability compound and a hole impregnation transportability compound have concentration distribution in the direction of thickness, its concentration of a hole impregnation transportability compound is high at a hole transportation layer side, the concentration dwindles it toward an electronic transportation layer side, on the other hand, the concentration of an electron injection transportability compound is high at an electronic transportation layer side, and they are good in a mixolimnion also as inclination film which the concentration dwindles toward a hole transportation layer side. In the inclination film, an electron injection transportability compound has the desirable thing of the electron injection transportability compound which exists in 1/2 field of the mixolimnion by the side of an electronic transportation layer at the whole mixolimnion for which 95-50 mass % extent existence is recognized, and it is desirable that the same relation is materialized also about a hole impregnation transportability compound.

[0140] The electron and the hole are distributed over the whole luminous layer, the recombination point and the luminescence point have spread in [whole] the luminous layer, and the blue luminous layer which consists of the above mixolimnions is emitting light not only near the interface between layers, but by the whole mixolimnion. This can be easily checked by fitting [the emission spectrum of an observation, and the emission spectrum which assumed the luminescence field and performed optical interference simulation of the reflected light in each optical interface, and direct light]. Thus, since it is possible to emit light in the whole layer, luminescence from which several sorts of wavelength which carried out the laminating differs can be taken out from one component to stability, and an advantage, such as prolonging the luminescence life of a component, is acquired.

[0141] The luminescence maximum wave length of the blue luminous layer in this invention is 400-500nm.

[0142] As for the thickness of the above mixolimnions, it is desirable that they are 1-500nm and further 20-200nm.

[0143] As for the organic EL device of <other luminescent color> this invention, it is desirable to deal with multicolor luminescence which has the luminous layer of at least one layer in which luminescence wavelength differs from this other than a blue luminous layer. Such luminous layers may be red (600-700nm of luminescence maximum wave length), and a thing which emits luminescence light, such as being green (500-560nm of luminescence maximum wave length).

[0144] Moreover, in these luminous layers, it is desirable to consider as the mixolimnion using the same host ingredient as a blue luminous layer, and to consider as the luminous layer which emits the luminescence light of a different color from blue by adding a dopant. Thereby, a recombination field will become desirable on generation of breadth and an exciton.

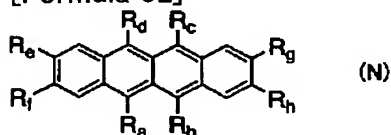
[0145] For example, there is a mixolimnion which carried out the dopant to the mixture of the aforementioned phenyl anthracene derivative and a tetra-aryl benzidine derivative as one desirable mode of such a mixolimnion, and doped the naphthacene derivative. For example, when rubrene is used as a naphthacene derivative, red (540-600nm of luminescence maximum

wave length) luminescence is attained. Addition of a naphthacene derivative is desirable from a viewpoint of the reinforcement of a component. In addition, an advantage with the same said of a pentacene derivative is acquired. These are indicated by JP,8-311442,A, WO 98/No. 08360, Japanese Patent Application No. No. 137505 [ten to], etc.

[0146] The compound expressed with a formula (N) as a naphthacene derivative is desirable.

[0147]

[Formula 52]



[0148] In a formula (N), R_a , R_b , R_c , and R_d express either the alkyl group which has unsubstituted or a substituent, an aryl group, the amino group, a heterocycle radical and an alkenyl radical, respectively, and it is desirable that they are either an aryl group, the amino group, a heterocycle radical and an alkenyl radical.

[0149] As an aryl group expressed with R_a , R_b , R_c , and R_d , you may be the thing of a monocycle or many rings, and the condensed ring and a ring set are also included. The number of total carbon may have the desirable thing of 6-30, and you may have the substituent.

[0150] As an aryl group expressed with R_a , R_b , R_c , and R_d , they are a phenyl group, a tolyl group (o-, m-, p-), a pyrenyl radical, a peri RENIRU radical, a koro NENIRU radical, a naphthyl group (1-, 2-), an anthryl radical, a biphenyl (o-, m-, p-) radical, a terphenyl radical, a phenan tolyl group, etc. preferably.

[0151] As an amino group expressed with R_a , R_b , R_c , and R_d , any are sufficient as an alkylamino radical, an arylamino radical, the aralkyl amino group, etc. As for these, it is desirable to have aliphatic series with 1-6 total carbon and/or the aromatic series ring of one to 4 ring. Specifically, a dimethylamino radical, a diethylamino radical, a dibutylamino radical, a diphenylamino radical, a ditolylamino radical, the bis-JIFENIRIRU amino group, the bis-naphthyl amino group, etc. are mentioned.

[0152] As a heterocycle radical expressed with R_a , R_b , R_c , and R_d , 5 members which contain O, N, and S as a hetero atom or the aromatic series heterocycle radical of six membered-rings, the condensation polycyclic aroma heterocycle radical of carbon numbers 2-20, etc. are mentioned. As an aromatic series heterocycle radical and a condensation polycyclic aroma heterocycle radical, a thienyl group, a furil radical, a pyrrolyl radical, a pyridyl radical, a quinolyl radical, a quinoxalyl radical, etc. are mentioned, for example.

[0153] You may be an unsubstituted thing although the phenyl alkenyl radical which has a phenyl group in one of the substituents at least (1- and 2-), a diphenyl (1, 2- and 2, and 2-) alkenyl radical, a triphenyl (1, 2, and 2-) alkenyl radical, etc. are desirable as an alkenyl radical expressed with R_a , R_b , R_c , and R_d .

[0154] When R_a , R_b , R_c , and R_d have a substituent, it is desirable that at least two of these substituents are either an aryl group, the amino group, a heterocycle radical, an alkenyl radical and an aryloxy radical. About an aryl group, the amino group, a heterocycle radical, and an alkenyl radical, it is the same as that of Above R_a , R_b , R_c , and R_d .

[0155] As an aryloxy radical used as the substituent of R_a , R_b , R_c , and R_d , what has an aryl group with 6-18 total carbon is desirable, and a phenoxy group (o-, m-, p-) etc. is specifically mentioned.

[0156] Two or more sorts of these substituents may form the condensed ring. Furthermore, you may permute and it is the same as that of the above as a desirable substituent in that case.

[0157] When R_a , R_b , R_c , and R_d have a substituent, it is desirable that the two or more sorts have the above-mentioned substituent at least. It may not be limited especially as the permutation location, and any of meta, Para, and the ortho position are sufficient. Moreover, although it is desirable respectively that it is the same as for R_a , and R_d , R_b and R_c , you may

differ.

[0158] Re, Rf, Rg, and Rh express either the alkyl group which may have hydrogen or a substituent, respectively, an aryl group, the amino group and an alkenyl radical.

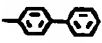
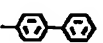




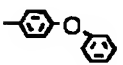
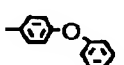
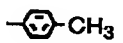

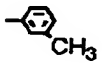
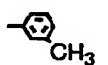
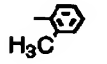
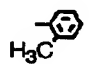


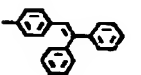
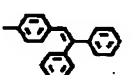
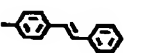
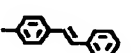
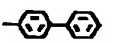

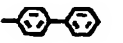
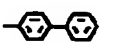
[0159] You may have branching, even if the thing of 1-6 has a desirable carbon number and it is a straight chain-like as an alkyl group expressed with Re, Rf, Rg, and Rh. As a desirable example of an alkyl group, a methyl group, an ethyl group, (n, i)-propyl group, (n, i, sec, tert)-butyl, a (n, i, neo, tert)-pentyl radical, etc. are mentioned.

[0160] As the aryl group expressed with Re, Rf, Rg, and Rh, the amino group, and an alkenyl radical, it is the same as that of the case of Above Ra, Rb, Rc, and Rd. Moreover, although it is desirable that it is the same respectively as for Re, and Rf, Rg and Rh, they may differ.

[0161] The example of a naphthacene derivative is shown below. The combination of a display of a formula (N) shows the example.







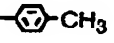
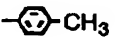




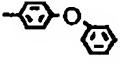
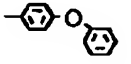




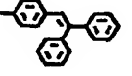
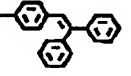
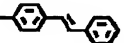
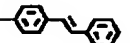








[0162]

[Formula 53]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
1	-Ph	-H	-H	-Ph	-H	-H	-H	-H
2		-H	-H		-H	-H	-H	-H
3		-H	-H		-H	-H	-H	-H
4		-H	-H		-H	-H	-H	-H
5		-H	-H		-H	-H	-H	-H
6		-H	-H		-H	-H	-H	-H
7		-H	-H		-H	-H	-H	-H
8		-H	-H		-H	-H	-H	-H
9		-H	-H		-H	-H	-H	-H
10		-H	-H		-H	-H	-H	-H
11		-H	-H		-H	-H	-H	-H
12		-CH ₃	-CH ₃		-CH ₃	-CH ₃	-CH ₃	-CH ₃
13		-H	-H		-CH ₃	-CH ₃	-CH ₃	-CH ₃







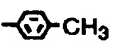


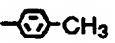


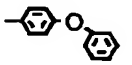
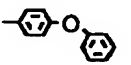




[0163]

[Formula 54]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
14	-Ph	-Ph	-Ph	-Ph	-H	-H	-H	-H
15		-Ph		-Ph	-H	-H	-H	-H
16					-H	-H	-H	-H
17		-Ph		-Ph	-H	-H	-H	-H
18					-H	-H	-H	-H
19		-Ph		-Ph	-H	-H	-H	-H
20		-Ph	-Ph		-H	-H	-H	-H
21		-Ph		-Ph	-H	-H	-H	-H
22		-Ph		-Ph	-H	-H	-H	-H
23		-Ph		-Ph	-H	-H	-H	-H
24					-H	-H	-H	-H
25					-H	-H	-H	-H

[0164]

[Formula 55]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
26	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-H	-H
27		-Ph		-Ph	-Ph	-Ph	-H	-H
28					-Ph	-Ph	-H	-H
29		-Ph		-Ph	-Ph	-Ph	-H	-H
30					-Ph	-Ph	-H	-H
31		-Ph		-Ph	-Ph	-Ph	-H	-H
32		-Ph	-Ph		-Ph	-Ph	-H	-H
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33		-Ph		-Ph	-Ph	-Ph	-H	-H
34		-Ph		-Ph	-Ph	-Ph	-H	-H
35		-Ph		-Ph	-Ph	-Ph	-H	-H
36					-Ph	-Ph	-H	-H
37					-Ph	-Ph	-H	-H

[0165]

[Formula 56]

No.	R _a	R _b	R _c	R _d	R _e	R _f	R _g	R _h
38	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph	-Ph
39		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
40					-Ph	-Ph	-Ph	-Ph
41		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
42					-Ph	-Ph	-Ph	-Ph
43		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
44		-Ph	-Ph		-Ph	-Ph	-Ph	-Ph
45		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
46		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
47		-Ph		-Ph	-Ph	-Ph	-Ph	-Ph
48					-Ph	-Ph	-Ph	-Ph
49					-Ph	-Ph	-Ph	-Ph

[0166] One sort of these compounds may be used or they may be used two or more sorts.

[0167] As for the amount of the naphthacene derivative used in a mixolimnion, it is desirable that it is 0.1 to 20 mass %.

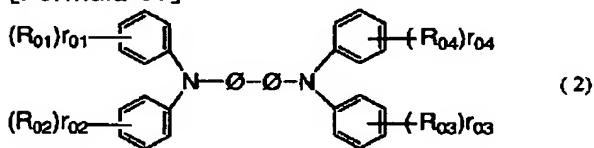
[0168] Moreover, as for the mixing ratio of the phenyl anthracene derivative and tetra-aryl benzidine derivative in such a mixolimnion, it is desirable that the volume ratios of a phenyl anthracene derivative / tetra-aryl benzidine derivative are 90 / 10 – 10/90. As for the thickness, it is desirable that they are 1–500nm and further 10–200nm.

[0169] Including a blue luminous layer, two-layer or the luminous layer of three layers can be prepared, and a component which carries out white luminescence can consist of this inventions.

[0170] Although the part was described above in <hole transportation and/or impregnation layer> this invention, it is desirable to prepare hole transportation and/or an impregnation layer. It is desirable to prepare a hole transportation layer, and to prepare hole transportation and/or an impregnation layer (for it to be called a hole impregnation transportation layer), when it is the last mode which would use the hole impregnation transportability compound in the layer as a host ingredient of a luminous layer. It is desirable to use the third class amine of aromatic series as a hole impregnation transportability compound in this case, and the triphenylamine derivative expressed with the tetra-aryl benzidine derivative and formula (2) which are expressed with a formula (1) is desirable. It is as [formula / (1)] above-mentioned. A formula (2) is explained.

[0171]

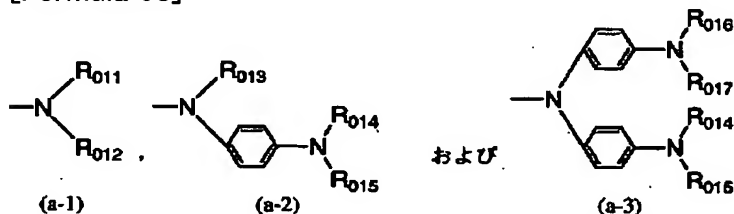
[Formula 57]



[0172] In a formula (2), two phi expresses a phenylene group. as the biphenylene radical of phi-phi — 4 and 4 — a — biphenylene radical, and — biphenylene radical, 3, and 3 '3, 4'— biphenylene radical, and '2, 2' — although you may be any of a — biphenylene radical, and — biphenylene radical, 2, and 3 '2, 4'—biphenylene radical — especially — 4 and 4' — biphenylene radical is desirable.

[0173] Moreover, R01, R02, R03, and R04 are an alkyl group, an aryl group, and a diaryl amino aryl group, respectively, [0174]

[Formula 58]



(ここで、R₀₁₁、R₀₁₂、R₀₁₃、R₀₁₄、R₀₁₅、R₀₁₆およびR₀₁₇は、それぞれ、アリール基を表す。)

[0175] It expresses whether it is *****, and these may be the same or may differ.

However, at least one of R01—the R04 expresses a diaryl amino aryl group or the above (a-1) of — (a-3), and either. The aryl group expressed with R011, R012, R013, R014, R015, R016, and R017 could be permuted, or may have a substituent, respectively.

[0176] The alkyl group expressed with R01, R02, R03, and R04 may have the substituent, also by the shape of a straight chain, you may have branching, and a thing with 1–20 total carbon is desirable, and a methyl group, an ethyl group, etc. are specifically mentioned.

[0177] As an aryl group expressed with R01, R02, R03, R04, R011, R012, R013, R014, R015,

R016, and R017 You may be the thing of a monocycle or many rings, and a thing with 6-20 total carbon is desirable, and, specifically, phenyl group, naphthyl group, anthryl radical, phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned. These aryl groups may be permuted further and the aryl group or alkoxy group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6, an aryloxy radical, and -N(R021) R022 grade are mentioned as such a substituent. Here, R021 and R022 express the aryl group which has no permuting or a substituent, respectively.

[0178] As an aryl group expressed with R021 and R022, you may be the thing of a monocycle or many rings, and a thing with 6-20 total carbon is desirable, phenyl group, naphthyl group, anthryl radical, phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned, and, specifically, a phenyl group is mentioned especially preferably. These aryl groups may be permuted further and the aryl group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6 is mentioned as such a substituent. A methyl group is mentioned preferably as said alkyl group, and a phenyl group is mentioned preferably as said aryl group.

[0179] Moreover, the diaryl amino aryl group expressed with R01, R02, R03, and R04 is for example, a diaryl aminophenyl radical, and what the diaryl amino group has combined with the meta position (the 3rd place) or the para position (the 4th place) to the frame expressed with a formula (2) in such a radical is desirable. Although the phenyl group at this time may have the substituent further, it is desirable to have only a diaryl amino group.

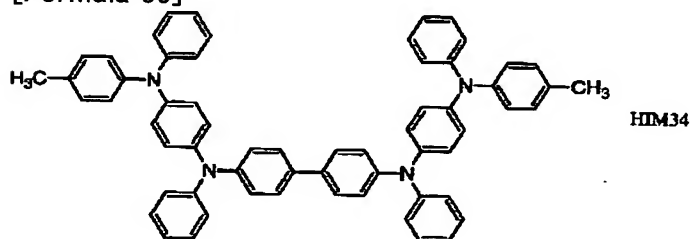
[0180] As an aryl group in the diaryl amino group, you may be the thing of a monocycle or many rings, and a thing with 6-20 total carbon is desirable, phenyl group, naphthyl group, anthryl radical, phenan tolyl group, pyrenyl radical, peri RENIRU radical and o-, m-, or p-biphenyl radical etc. is mentioned, and, specifically, a phenyl group is mentioned especially preferably. These aryl groups may be permuted further and the aryl group which has the alkyl group, no permuting, or the substituent of carbon numbers 1-6 is mentioned as such a substituent. A methyl group is mentioned preferably as said alkyl group, and a phenyl group is mentioned preferably as said aryl group. Moreover, as a substituent of an aryl group, the above-mentioned radicals other than the diaryl amino aryl group expressed with R01-R04 in a formula (2) are also desirable. When it has a substituent two or more, even if they are the same, they may differ. Moreover, as for a substituent, it is desirable to have combined with the meta position or the para position to the joint location of N.

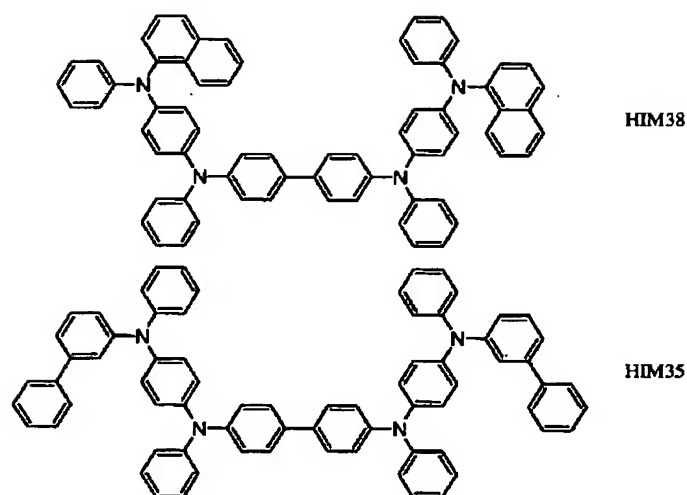
[0181] Moreover, in a formula (2), respectively, as for r01, r02, r03, and r04, it is desirable, although the integer of 0-2 is expressed preferably 0-5, and that it is especially 0 or 1. And as for especially r01+r02+r03+r04, to 1-4, and a pan, 2-4 are [one or more] desirable. Said R01, R02, R03, and R04 It combines with the meta position or the para position to the joint location of N. The meta position and all of R01, R02, R03, and R04 The para position, [all of R01, R02, R03, and R04] Or these may be intermingled even if R01, R02, R03, and R04 have combined with the meta position or the para position. When r01, r02, r03, or r04 are two or more, even if R01 comrades, R02 comrades, R03 comrades, or R04 comrades is the same, they may differ, and further, these adjoining things may join together mutually and they may form a ring. Such a ring may be a ring of aromatic series, such as the benzene ring, or may be a ring of aliphatic series, such as a cyclohexane ring.

[0182] Although the desirable example of a formula (2) is shown below, it is not limited to this.

[0183]

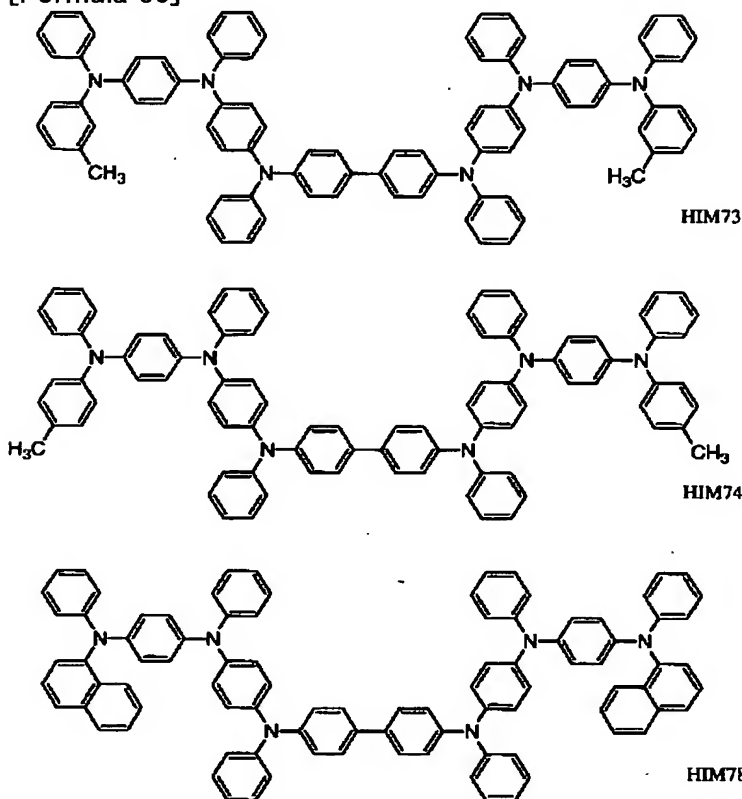
[Formula 59]





[0184]

[Formula 60]



[0185] One sort of these may be used or may be used together two or more sorts.

[0186] It is desirable to use the compound of a formula (1) for a hole transportation layer, and to use the compound of a formula (2) for a hole impregnation layer from a luminous layer side, when preparing a hole transportation layer and a hole impregnation layer in order. The function which blocks an electron improves by combining such a compound. Anyway, it is desirable to use the third class amine of aromatic series which has a benzidine frame in a hole transportation layer, and does not have a phenylenediamine frame, and it is desirable to use the third class amine of aromatic series which has a phenylenediamine frame in a hole

impregnation layer.

[0187] The thickness of a hole impregnation layer has 1–1000nm and desirable further 1–100nm, and the thickness of a hole transportation layer has 1–200nm and desirable further 5–100nm. When preparing one layer of these layers, it is desirable to consider as the thickness of 1–1000nm and further 10–500nm.

[0188] Although the part was described above in <electronic transportation and/or impregnation layer> this invention, it is desirable to prepare electronic transportation and/or an impregnation layer. It is desirable to prepare an electronic transportation layer, and to prepare electronic transportation and/or an impregnation layer (for it to be called an electron injection transportation layer), when it is the last mode which would use the electron injection transportability compound in the layer as a host ingredient of a luminous layer. Quinoline derivatives, such as an organometallic complex which makes a ligand eight quinolinols, such as tris (8-quinolinolato) aluminum (AlQ3) besides the aforementioned phenyl anthracene derivative, thru/or the derivative of those as an electron injection transportability compound in this case, an OKISA diazole derivative, a perylene derivative, a pyridine derivative, a pyrimidine derivative, a quinoxaline derivative, a diphenyl quinone derivative, a nitration fluorene derivative, etc. can be used.

[0189] It is also desirable to use the former for the electronic transportation layer by the side of a luminous layer, and to use the latter for the electron injection layer by the side of cathode using the aluminum complex (especially tris (8-quinolinolato) aluminum) which makes a ligand especially the diphenyl ANTORAN derivative of a formula (A), an eight quinolinol, or its derivative. In addition, it is indicated by WO 98/No. 08360 etc. about the aluminum complex which makes an eight quinolinol thru/or its derivative a ligand.

[0190] The thickness of an electron injection layer has 1–1000nm and desirable further 1–100nm, and the thickness of an electronic transportation layer has 1–500nm and desirable further 1–100nm. When preparing one layer of these layers, it is desirable to consider as the thickness of 1–1000nm and further 1–100nm.

[0191] It is desirable to use the halogenide of alkali metal (Li, Na, K, Rb, Cs, etc.) and an oxide for the cathode material used in <cathode> this invention. Specifically Lithium fluoride (LiF), a lithium chloride (LiCl), a lithium bromide (LiBr), a lithium iodide (LiI), a sodium fluoride (NaF), a sodium chloride (NaCl), a sodium bromide (NaBr), a sodium iodide (NaI), Rubidium fluoride (RbF), a rubidium chloride (RbCl), a rubidium bromide (RbBr), Oxides, such as a halogenide of an iodation rubidium (RbI), cesium fluoride (CsF), a cesium chloride (CsCl), a cesium bromide (CsBr), and a cesium iodide (CsI), and lithium oxide (Li₂O), sodium oxide (Na₂O), are mentioned. Halogenides, such as Rb and Cs, a division chloride, and an iodide are especially desirable.

[0192] The halogenide of alkali metal and an oxide may be used as a lower layer, and a laminating may be carried out with an ingredient with a still smaller work function (for example, Li, Na, K, Mg, aluminum, Ag, In, or the alloy containing these one or more sorts). As for cathode, it is desirable that crystal grain is fine, and it is desirable that it is especially in an amorphous condition. As for the sum total thickness of cathode, it is desirable to be referred to as about 10–1000nm. The lower layer thickness in the configuration using a lower layer is about 0.1–1nm.

[0193] Especially with the component which has a blue luminous layer, it is effective to use the halogenide of alkali metal and an oxide as a cathode material, and it is stabilized and can obtain blue luminescence light. Since a host's energy gap is large compared with a green system by the blue luminescence system, more efficient electron injection nature and hole impregnation nature are required. Electron injection effectiveness is bad and an alkali-metal system is effective as an efficient ingredient which changes to this in cathode like the conventional MgAg. It is because the work function is small. Moreover, about the gestalt of a halogenide and an oxide, very much, reduction etc. takes place and a work function can become a metal, when it does not change or electric field are built. Therefore, handling is the optimal as an easy electron injection ingredient. Moreover, there is effectiveness [electrode / the organic film and] of the improvement in adhesion.

[0194] Especially the thing for which the halogenide of alkali metal and an oxide are used as a cathode material is indispensable in the mode which uses neither the electron injection transportability compound of an electronic transportation layer or a hole transportation layer used as the adjacent layer, nor a hole impregnation transportability compound for a blue luminous layer as a host ingredient.

[0195] Moreover, metals, such as Li, may be doped to the organic layer of a cathode interface.

[0196] Moreover, the closure effectiveness improves aluminum and a fluorine system compound by vacuum evaporatio~~no~~ and carrying out a spatter at the last of electrode formation.

[0197] In addition, when using tris (8-quinolinolato) aluminum (AlQ3) etc. for electron injection and/or a transportation layer and forming cathode by the spatter, in order to prevent the damage by electron injection and/or the spatter to a transportation layer, the layer of naphthacene derivatives (above), such as rubrene, can be formed between electron injection and/or a transportation layer, and cathode at 0.1–20nm thickness.

[0198] In order to carry out field luminescence of the <anode plate> organic EL device, it is desirable transparence thru/or that one [at least] electrode determines the ingredient and thickness of an anode plate that it needs to be translucent, and the permeability of luminescence light will become 80% or more preferably since the ingredient of cathode has a limit as mentioned above. It is desirable to specifically use for an anode plate the polypyrrole which doped ITO (tin dope indium oxide), IZO (zinc dope indium oxide), SnO₂, nickel, Au, Pt and Pd, and a dopant, and especially ITOIZO is desirable. ITO is usually In 2O₃. Although SnO is contained with stoichiometric composition, some amounts of oxygen may be deflected after this. IZO is usually In 2O₃. Although ZnO is contained with stoichiometric composition, some amounts of oxygen may be deflected after this. In 2O₃ Receiving SnO₂ One to 20 mass %, and further 5 – 12 mass % of a mixing ratio are desirable. Moreover, In 2O₃ in IZO The mixing ratio of receiving ZnO is usually 12 – 32 mass % extent. Moreover, as for the thickness of an anode plate, it is desirable to be referred to as about 10–500nm. Moreover, although it is required for driver voltage to be low in order to raise the dependability of a component, ITO below 10–30ohm/**, or 10ohms / ** (usually 0.1–10ohm/**) is mentioned as a desirable thing.

[0199] Moreover, in a large device like a display, since resistance of ITO becomes large, aluminum wiring may be carried out.

[0200] Although there is especially no limit in a <substrate ingredient> substrate ingredient, in order to take out luminescence light from a substrate side, the transparence thru/or translucent ingredient of glass, resin, etc. is used. Moreover, the fluorescence conversion filter film which contains the color filter film and the fluorescence matter in a substrate, or the dielectric reflective film may be used, or the substrate itself may be colored, and the luminescent color may be controlled.

[0201] What is necessary is to adjust the property of a color filter according to the light in which an organic EL device emits light, and just to optimize ejection effectiveness and color purity, although what is necessary is just to use for the color filter film the color filter used with the liquid crystal display etc.

[0202] Moreover, if the color filter which can cut the outdoor daylight of short wavelength in which an EL element ingredient and a fluorescence conversion layer carry out light absorption is used, the contrast of the lightfastness and a display of a component will also improve.

[0203] Moreover, it is good as for instead of a color filter using an optical thin film like dielectric multilayers.

[0204] Although the fluorescence conversion filter film is absorbing the light of EL luminescence and making light emit from the fluorescent substance in the fluorescence conversion film and performs color conversion of the luminescent color, it is formed from three, a binder, a fluorescence ingredient, and a light absorption ingredient, as a presentation.

[0205] As for a fluorescence ingredient, it is [that what is necessary is just to use what has a high fluorescence quantum yield] fundamentally desirable that absorption is strong in EL luminescence wavelength region. What is necessary is in fact, for laser coloring matter etc. to

be suitable and just to use a rhodamine system compound, a perylene system compound, a cyanine system compound, a phthalocyanine system compound (for a subphthalocyanine etc. to be included), a naphthalo imide system compound and a condensed-ring hydrocarbon system compound, a condensation heterocycle system compound, a styryl system compound, a coumarin system compound, etc.

[0206] As for a binder, what can perform detailed patterning in photolithography, printing, etc. is [that what is necessary is just to choose an ingredient which does not quench fluorescence fundamentally] desirable. Moreover, an ingredient which does not receive a damage at the time of membrane formation of ITO is desirable.

[0207] When the light absorption of a fluorescence ingredient is insufficient, it uses, but when there is no need, it is not necessary to use a light absorption ingredient. A light absorption ingredient should just choose an ingredient which does not quench the fluorescence of a fluorescence ingredient.

[0208] In <luminescent color modulation using color filter> this invention, by combining an above-mentioned organic EL device and an above-mentioned color filter, the luminescent color of the above-mentioned organic EL device can be modulated, and, thereby, a multicolor luminescence organic electroluminescence display (multicolor luminescence equipment) can provide easily.

[0209] When applying the above-mentioned organic EL device to such equipment, the organic EL device which contains a luminous layer in inter-electrode [of the pair which the above-mentioned organic EL device counters mutually] is pinched, as for one [at least] electrode, it is desirable that it is a transparent electrode, but since a color filter is used, one [at least] electrode needs to be a transparent electrode, and in order to take out luminescence light from a transparent electrode side, a color filter is installed in a transparent electrode side.

[0210] Here, an organic layer shall mean the layer containing an organic compound, and a metal complex, an organometallic compound, etc. which make an organic compound a ligand shall be included in an organic compound.

[0211] Although above equipment has the display of a dot-matrix mold even if it has the display of a segmental die, it may be equipped with both display of these.

[0212] The display of a dot-matrix mold counters mutually, and has XY matrix type electrode with which two or more electrodes of a pair were arranged, and forms a pixel by making inter-electrode [for this intersection] pinch an organic layer so that it may cross. As for a color filter, it is desirable to install in the transparent electrode side of this pixel. Moreover, it is the periphery of a pixel and it is desirable to install a black matrix near the color filter installation part (usually between color filters). The leakage light between color filters can be prevented by the black matrix, and, thereby, the visibility of multicolor luminescence can be raised.

[0213] Here, with a pixel, the field of the image display array which is excited independently and can emit light is called other fields.

[0214] Two or more above-mentioned electrodes are usually stripe-like electrodes, and the electrode of a pair is arranged so that it may intersect perpendicularly mostly. In addition, since the electrode of another side is formed in many cases and the display of a dot-matrix mold is formed on manufacture using an interlayer insulation film in many cases, after a stripe-like electrode forms one electrode, Although the case where the stripe-like electrode of another side formed behind is not mostly formed on the same flat surface, the case where the stripe of the one same direction does not serve as continuation film, etc. may arise, it does not interfere, if only the amount of [which intersects perpendicularly mostly] intersection exists.

[0215] For example, there is the following approach as an approach of forming a dot-matrix mold display. 1 micrometer formed by transparence resin, such as acrylic resin and polyimide, in order to form a predetermined color filter layer on transparence substrates (glass etc.) and to raise the surface smoothness of this field preferably to the transparent electrode forming face of this color filter layer - the overcoat layer of 5mm thickness is prepared. This overcoat layer functions also as a protective layer of a color filter. Patterning of this overcoat layer is carried out, and a transparent electrode is formed on the overcoat layer which carried out

patterning. In addition, between a transparent electrode layer and an overcoat layer, transparency and an electric insulation inorganic oxide layer may be prepared as a passivation layer.

[0216] To the field containing the transparent electrode layer which carried out patterning, it is 10nm – 100 micrometers. The interlayer insulation film of thickness is prepared and it is made for an insulator layer to remain in parts other than a transparent electrode formation part. An insulator layer can be formed by resin, such as polyimide besides inorganic compounds, such as SiO₂ and SiN_x, acrylic resin, and an epoxy resin.

[0217] Furthermore, a spacer is formed on [other than an insulator layer] an insulator layer in this case, or an overhang object with still larger width of face than a spacer is formed on a spacer, and there is also the approach of carrying out isolation (JP,9-330792,A etc.).

[0218] Then, the organic layer containing the luminous layer in the above-mentioned organic EL device is formed, and a luminescence function can be given to a part for the intersection of an electrode pair, if a counter-electrode is further prepared so that the aforementioned transparent electrode may be intersected. As for the above-mentioned insulator layer, it is desirable to make it leave after component formation, and it can avoid useless luminescence in the part which is not visible from a substrate side by existence of the above-mentioned insulator layer. Moreover, what is necessary is just to install a black MATORIKUSSU layer between color filter layers, when using a black matrix.

[0219] As a color filter used for <color filter and black matrix> i color filter this invention, only the following coloring matter can mention the thing of a solid state which dissolves or distributed coloring matter in binder resin, for example.

[0220] Red (R) coloring matter: Items, such as a perylene system pigment, a lake pigment, an azo system pigment, the Quinacridone system pigment, an anthraquinone system pigment, an anthracene system pigment, an iso indoline system pigment, and an isoindolinone system pigment, and at least two or more kinds of mixture [0221] Green (G) coloring matter: Items,

such as a halogen multi-permutation phthalocyanine system pigment, a halogen multi-permutation copper-phthalocyanine system pigment, TORIFERU methane system basic dye, an iso indoline system pigment, and an isoindolinone system pigment, and at least two or more kinds of mixture [0222] Blue (B) coloring matter: Items, such as a copper-phthalocyanine

system pigment, an indan SURON system pigment, an indophenol system pigment, a cyanine system pigment, and a dioxazine system pigment, and at least two or more kinds of mixture [0223] On the other hand, the transparent (50% or more of lights) ingredient of binder resin is desirable. For example, transparency resin (macromolecule), such as polymethylmethacrylate,

polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, and a carboxymethyl cellulose, is mentioned.

[0224] In addition, in order to carry out separation arrangement of the color filter superficially, the photopolymer which can apply the photolithography method is also chosen. For example, the photo-curing mold resist ingredient which has reactant vinyl groups, such as an acrylic-acid system, a methacrylic-acid system, the Pori cinnamic-acid vinyl system, and a ring rubber system, is mentioned. Moreover, when using print processes, the printing ink (medium) using transparent resin is chosen. For example, transparency resin, such as the constituent which consists of the monomer of polyvinyl chloride resin, melamine resin, phenol resin, alkyd resin, an epoxy resin, polyurethane resin, polyester resin, maleic resin, and polyamide resin, oligomer, and a polymer and polymethylmethacrylate, polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, hydroxyethyl cellulose, and a carboxymethyl cellulose, can be used.

[0225] When a color filter mainly consists of coloring matter When membranes are formed by vacuum deposition or the sputtering method through the mask of a desired color filter pattern and it consists of coloring matter and binder resin on the other hand A fluorochrome, the above-mentioned resin, and a resist are made to mix, distribute or solubilize. It is common to form membranes by approaches, such as a spin coat, a roll coat, and the cast method, to carry out patterning by the pattern of the color filter of a request [**** / carrying out patterning by the color filter pattern of a request by the photolithography method] by

approaches, such as printing, to heat-treat, and to make it harden.

[0226] As for the thickness and the permeability of each color filter, considering as the following is desirable. R: 0.5–20 micrometers (50% or more of permeability, 610nm) of thickness, 0.5–20 micrometers (50% or more of permeability, 545nm) of G:thickness, B : 0.2–20 micrometers (50% or more of permeability, 460nm) of thickness

[0227] Moreover, what especially a color filter becomes from coloring matter and binder resin should just be the range where the concentration of coloring matter can carry out patterning of the color filter satisfactory, and can penetrate luminescence of an organic EL device enough. 5–50 mass % Coloring matter is contained in the color filter film including the binder resin to be used although based also on the class of coloring matter.

[0228] ii) As a black matrix used for black matrix this invention, the pigmentum nigrum can be mentioned to the following metal and a metallic-oxide thin film, and a list, for example. As an example of a metal and a metallic-oxide thin film, the thin film of metals, such as chromium (Cr), nickel (nickel), and copper (Cu), and the oxide of those can be mentioned. As mixture of the above-mentioned metal and a metallic oxide, a with an optical density of 3.0 or more (10–300nm (100–3000Å) of thickness) thing is desirable.

[0229] As an example of the pigmentum nigrum, the coloring matter of carbon black, black titanium oxide, aniline black, or a color filter can be mixed, and the black-ized thing or the thing of a solid state which dissolves or distributed the above-mentioned coloring matter as well as a color filter in binder resin can be mentioned.

[0230] The sputtering method, vacuum deposition, a CVD method, etc., the membrane formation back can be performed on the whole display surface by the whole insulating substrate surface and the technique of masking, they can perform patterning by the photolithography method at least, and a metal and a metallic-oxide thin film can form the pattern of a black matrix.

[0231] When the pigmentum nigrum is used, patterning can be carried out like the case of a color filter, and a black matrix can be formed.

[0232] < protective layer (in transparence flat film) this invention, the protective layer (transparence flat film) used if needed is used, in order that a color filter (a black matrix is included) may protect getting damaged physically and deteriorating by the external environmental factor (water, oxygen, light). It is desirable that it is a transparent (50% or more of lights) ingredient as the ingredient.

[0233] Specifically, what has the reactant vinyl group of an acrylate system and a methacrylate system can be mentioned like photo-curing mold resin and/or heat-curing mold resin. Moreover, transparence resin, such as the monomer of melamine resin, phenol resin, alkyd resin, an epoxy resin, polyurethane resin, polyester resin, maleic resin, and polyamide resin, oligomer, a polymer, polymethylmethacrylate, polyacrylate, a polycarbonate, polyvinyl alcohol, a polyvinyl pyrrolidone, polyimide, hydroxyethyl cellulose, and a carboxymethyl cellulose, can be mentioned. In order to raise the lightfastness of a color filter and an organic EL device, an ultraviolet ray absorbent can also be added in a protective layer.

[0234] A protective layer forms the above-mentioned ingredient by approaches, such as a spin coat, a roll coat, and the cast method, when liquefied, heat curing of the photo-curing mold resin is carried out if needed [after an exposure] for light, and heat curing of the heat-curing mold is carried out as it is after membrane formation. In the case of-like [film], a binder may be applied and stuck as it is.

[0235] If it becomes thick too much although there is especially no limit since protection layer thickness hardly affects an angle of visibility, since the permeability of light will be affected, it can usually choose in 1 micrometer – 5mm.

[0236] The transparence and electric insulation inorganic oxide layer which are used for <transparence and electric insulation inorganic oxide layer> this invention can be formed by carrying out a laminating on a color filter or a protective layer by vacuum evaporatio or sputtering, DIPINGU, etc. In addition, this transparence and an electric insulation inorganic oxide layer may be monolayers, or may be a double layer more than a bilayer. For example, by considering as a bilayer, the elution of the inorganic ion from lower layer inorganic oxide layers

(for example, soda-lime glass etc.) can be stopped in the upper inorganic oxide layer, and an organic EL device can be protected from elution ion.

[0237] As the ingredient, silicon oxide (SiO_2), an aluminum oxide (aluminum 2O_3), Titanium oxide (TiO_2), yttrium oxide (Y_2O_3), a germanium dioxide (GeO_2), A zinc oxide (ZnO), a magnesium oxide (MgO), a calcium oxide (CaO), Although a way acid (B_2O_3), a strontium oxide (SrO), the barium oxide (BaO), a lead oxide (PbO), a zirconia (ZrO_2), sodium oxide (Na_2O), lithium oxide (Li_2O), potassium oxide (K_2O), etc. can be mentioned Silicon oxide, an aluminum oxide, and titanium oxide have the high transparency of the layer (film), and the membrane formation temperature is low temperature (250 degrees C or less) comparatively, and since most color filters or protective layers are not degraded, it is desirable.

[0238] Moreover, the low-temperature (150 degrees C or less) actuation which sticks on a color filter or a protective layer is possible for the case of the glass plate which formed the compound more than a kind chosen from the group which consists of a glass plate or the above-mentioned silicon oxide, an aluminum oxide, titanium oxide, etc. as transparence and an electric insulation inorganic oxide layer on either [at least] the top face of a transparent insulating glass plate, or the inferior surface of tongue, and since a color filter top or a protective layer completely is not degraded, it is more desirable. Moreover, especially a glass plate has the large effectiveness which intercepts degradation gas, such as a steam, oxygen, or a monomer.

[0239] As a presentation of a glass plate, what is shown in Table 1 or 2 can be mentioned. Especially, soda-lime glass, barium strontium content glass, lead glass, aluminosilicate glass, borosilicate glass, barium borosilicate glass, etc. can be mentioned. In addition, the nitride (for example, Si_3N_4) may be contained here that an electric insulation inorganic oxide layer should just be what mainly contains an inorganic oxide as the presentation.

[0240] Although there will be especially no limit if the thickness of transparence and an electric insulation inorganic oxide layer does not bar luminescence of an organic EL device, in this invention, 0.01 micrometers or more 200 micrometers or less are desirable. The glass plate which formed the compound more than a kind chosen from the group which consists of a glass plate or the above-mentioned silicon oxide, an aluminum oxide, titanium oxide, etc. on either [at least] the top face of a transparent insulating glass plate or the inferior surface of tongue has 1 micrometers or more desirable 200 micrometers or less on the precision of sheet glass, and reinforcement. In addition, if the thickness of transparence and an electric insulation inorganic oxide layer becomes small, here Although it will be based also on the definition of a color filter if the monolayer of an inorganic oxide particle is approached, it becomes difficult to intercept degradation gas, such as a steam generated from a color filter or the organic substance of a protective layer, oxygen, or a monomer, and thickness becomes large Luminescence of an organic EL device narrows the angle of visibility of a leakage broth and multicolor luminescence from a gap with a color filter, and may reduce the practicality of multicolor luminescence equipment.

[0241]

[Table 1]

ガラス組成系	
1)	$\text{R}_2\text{O}-\text{R}'\text{O}-\text{SiO}_2$ $\cdot \text{Na}_2\text{O}-\text{CaO}/\text{MgO}-\text{SiO}_2$ (ソーダ石灰ガラス) $\cdot \text{Na}_2\text{O}/\text{K}_2\text{O}-\text{BaO}/\text{SrO}-\text{SiO}_2$ $\cdot \text{Na}_2\text{O}/\text{K}_2\text{O}-\text{CaO}/\text{ZnO}-\text{SiO}_2$
2)	$\text{R}_2\text{O}-\text{PbO}-\text{SiO}_2$ $\cdot \text{K}_2\text{O}/\text{Na}_2\text{O}-\text{PbO}-\text{SiO}_2$ (鉛ガラス)
3)	$\text{R}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$ $\cdot \text{Na}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$ (ホウケイ酸ガラス) $\cdot \text{K}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$
4)	$\text{R}'\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$ $\cdot \text{PbO}-\text{B}_2\text{O}_3-\text{SiO}_2$ $\cdot \text{PbO}/\text{ZnO}-\text{B}_2\text{O}_3-\text{SiO}_2$ $\cdot \text{PbO}-\text{B}_2\text{O}_3-\text{SiO}_2 + (\text{ファイラー})$ $\cdot \text{ZnO}-\text{B}_2\text{O}_3-\text{SiO}_2$
5)	$\text{R}'\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$

$\cdot \text{CaO} / \text{MgO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$ (アルミノケイ酸塩ガラス) $\cdot \text{MgO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$ $\cdot \text{PbO} / \text{ZnO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$	
6) $\text{R}_2\text{O} - \text{Al}_2\text{O}_3 - \text{SiO}_2$ $\cdot \text{Li}_2\text{O} - \text{Al}_2\text{O}_3 - \text{SiO}_2$ $\cdot \text{Na}_2\text{O} - \text{Al}_2\text{O}_3 - \text{SiO}_2$	R : 1価の元素 R' : 2価の元素 R'' : 3価の元素
7) $\text{R}'\text{O} - \text{TiO}_2 - \text{SiO}_2$ $\cdot \text{BaO} - \text{TiO}_2 - \text{SiO}_2$	
8) $\text{R}_2\text{O} - \text{ZrO}_2 - \text{SiO}_2$ $\cdot \text{Na}_2\text{O} / \text{Li}_2\text{O} - \text{ZrO}_2 - \text{SiO}_2$	
9) $\text{R}'\text{O} - \text{P}_2\text{O}_5 - \text{SiO}_2$ $\cdot \text{CaO} - \text{P}_2\text{O}_5 - \text{SiO}_2$	
10) $\text{R}'\text{O} - \text{SiO}_2$ $\cdot \text{CaO} / \text{BaO} / \text{PbO} - \text{SiO}_2$	
11) SiO_2	
12) $\text{R}_2\text{O} - \text{R}'\text{O} - \text{B}_2\text{O}_3$ $\cdot \text{Li}_2\text{O} - \text{BeO} - \text{B}_2\text{O}_3$	
13) $\text{R}'\text{O} - \text{R}_2'\text{O}_3 - \text{B}_2\text{O}_3$ $\cdot \text{CaO} / \text{BaO} - \text{Al}_2\text{O}_3 - \text{B}_2\text{O}_3$ $\cdot \text{CaO} / \text{PbO} - \text{Lu}_2\text{O}_3 - \text{B}_2\text{O}_3$	
14) $\text{R}_2\text{O} - \text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5$ $\cdot \text{K}_2\text{O} - \text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5$	
15) $\text{R}'\text{O} - \text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5$ $\cdot \text{BaO} / \text{CaO} - \text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5$ $\cdot \text{ZnO} - \text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5$	

[0242]

[Table 2]

区 分	組 成 物 (主として1~3成分系として表わす)
1 単酸化物	$\text{SiO}_2, \text{B}_2\text{O}_3, \text{GeO}_2, \text{As}_2\text{O}_3$
2 ケイ酸塩	$\text{Li}_2\text{O} - \text{SiO}_2, \text{Na}_2\text{O} - \text{SiO}_2, \text{K}_2\text{O} - \text{SiO}_2$ $\text{MgO} - \text{SiO}_2, \text{CaO} - \text{SiO}_2, \text{BaO} - \text{SiO}_2, \text{PbO} - \text{SiO}_2$ $\text{Na}_2\text{O} - \text{CaO} - \text{SiO}_2$ $\text{Al}_2\text{O}_3 - \text{SiO}_2$
3 ホウ酸塩	$\text{Li}_2\text{O} - \text{B}_2\text{O}_3, \text{Na}_2\text{O} - \text{B}_2\text{O}_3, \text{K}_2\text{O} - \text{B}_2\text{O}_3$ $\text{MgO} - \text{B}_2\text{O}_3, \text{CaO} - \text{B}_2\text{O}_3, \text{PbO} - \text{B}_2\text{O}_3$ $\text{Na}_2\text{O} - \text{CaO} - \text{B}_2\text{O}_3, \text{ZnO} - \text{PbO} - \text{B}_2\text{O}_3$ $\text{Al}_2\text{O}_3 - \text{B}_2\text{O}_3, \text{SiO}_2 - \text{B}_2\text{O}_3$
4 リン酸塩	$\text{Li}_2\text{O} - \text{P}_2\text{O}_5, \text{Na}_2\text{O} - \text{P}_2\text{O}_5$ $\text{MgO} - \text{P}_2\text{O}_5, \text{CaO} - \text{P}_2\text{O}_5, \text{BaO} - \text{P}_2\text{O}_5$ $\text{K}_2\text{O} - \text{BaO} - \text{P}_2\text{O}_5$ $\text{Al}_2\text{O}_3 - \text{P}_2\text{O}_5, \text{SiO}_2 - \text{P}_2\text{O}_5, \text{B}_2\text{O}_3 - \text{P}_2\text{O}_5$ $\text{V}_2\text{O}_5 - \text{P}_2\text{O}_5, \text{Fe}_2\text{O}_3 - \text{P}_2\text{O}_5, \text{WO}_3 - \text{P}_2\text{O}_5$
5 ゲルマン酸塩ガラス	$\text{Li}_2\text{O} - \text{GeO}_2, \text{Na}_2\text{O} - \text{GeO}_2, \text{K}_2\text{O} - \text{GeO}_2$ $\text{B}_2\text{O}_3 - \text{GeO}_2, \text{SiO}_2 - \text{GeO}_2$
6 タングステン酸塩	$\text{Na}_2\text{O} - \text{WO}_3, \text{K}_2\text{O} - \text{WO}_3$
7 モリブデン酸塩	$\text{Na}_2\text{O} - \text{MoO}_3, \text{K}_2\text{O} - \text{MoO}_3, \text{Li}_2\text{O} - \text{MoO}_3$
8 テルル酸塩	$\text{Na}_2\text{O} - \text{TeO}_2$
9 ホウケイ酸塩	$\text{Na}_2\text{O} - \text{B}_2\text{O}_3 - \text{SiO}_2$
10 アルミノケイ酸塩	$\text{Na}_2\text{O} - \text{Al}_2\text{O}_3 - \text{SiO}_2, \text{CaO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$
11 アルミノホウ酸塩	$\text{CaO} - \text{Al}_2\text{O}_3 - \text{B}_2\text{O}_3, \text{ZnO} - \text{Al}_2\text{O}_3 - \text{B}_2\text{O}_3$
12 アルミノホウケイ酸塩	$\text{Na}_2\text{O} - \text{Al}_2\text{O}_3 - \text{B}_2\text{O}_3 - \text{SiO}_2$
13 フッ化物	$\text{BeF}_2, \text{NaF} - \text{BeF}_2$ $\text{ZrF}_4 - \text{BaF}_2 - \text{ThF}_4, \text{GdF}_3 - \text{BaF}_2 - \text{ZrF}_4$
14 フッリン酸塩	$\text{Al}(\text{PO}_3)_3 - \text{AlF}_3 - \text{NaF} - \text{CaF}_2$
15 オキシハロゲン化物	$\text{Ag}_2\text{O} - \text{AgI} - \text{P}_2\text{O}_5$
16 オキシナイトライド	$\text{MgO} - \text{Al}_2\text{O}_3 - \text{AlN} - \text{SiO}_2$

[0243] The <manufacture approach of an organic EL device>, next the manufacture approach of the organic EL device of this invention are explained. As for an anode plate, it is desirable to form by vapor growth, such as vacuum deposition and a spatter.

[0244] Although forming by vacuum deposition or the spatter is possible, when the point which forms membranes on an organic layer is taken into consideration, vacuum deposition of cathode with few damages to an organic layer is desirable.

[0245] It is desirable to use a vacuum deposition method for formation of organic layers, such as a luminous layer, since a homogeneous thin film can be formed. When a vacuum deposition method is used, an amorphous condition or the diameter of crystal grain is 0.1 micrometers. The following (0.001 micrometers of lower limits are usually extent.) homogeneous thin films are obtained. The diameter of crystal grain is 0.1 micrometers. If it has exceeded, it will become uneven luminescence, driver voltage of a component must be made high, and the injection efficiency of a charge will also fall remarkably.

[0246] Considering as the degree of vacuum of 10⁻³ or less Pa, although especially the conditions of vacuum deposition are not limited, an evaporation rate is 0.1 – 1 nm/sec. Considering as extent is desirable. Moreover, it is desirable to form each class continuously in a vacuum. If it forms continuously in a vacuum, since it can prevent an impurity sticking to the interface of each class, a high property is acquired. Moreover, driver voltage of a component can be made low or generating and growth of a dark spot can be suppressed.

[0247] When using a vacuum deposition method for formation of these each class, the vapor codeposition evaporated from a source of vacuum evaporatio which a mixolimnion etc. carries out temperature control of each boat into which the compound was put when making one layer contain two or more compounds according to an individual, and is different is desirable, but when vapor pressure (evaporation temperature) is comparable or very near, it can be made to be able to mix within the same vacuum evaporatio board beforehand, and can also vapor-deposit.

[0248] moreover — in addition, the solution applying methods (a spin coat, a DIP, cast, etc.) and Langmuir BUROJETTO (LB) — law etc. can also be used. It is good also as a configuration which distributes each compound in matrix matter (resin binder), such as a polymer, by the solution applying method. In addition, it is as [approach / of a color filter / formation] above-mentioned.

[0249] Although the organic EL device of this invention is used as an EL element of a direct-current drive mold, it can usually be alternating-current-driven or pulse driven. Applied voltage is usually 2–10V. It is lower than extent and the conventional thing.

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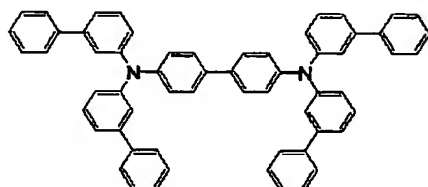
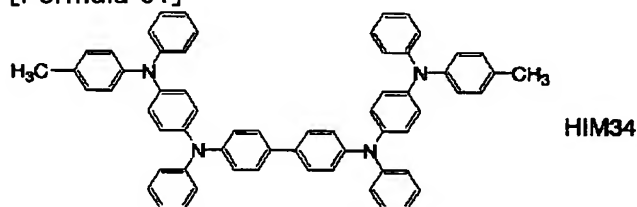
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EXAMPLE

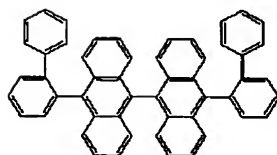
[Example] Hereafter, the example of this invention is shown with the example of reference, and this invention is further explained to a detail. The structure expression of the compound used in the example is shown.

[0251]

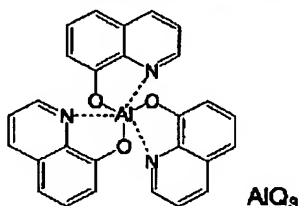
[Formula 61]



テトラアリールベンジジン誘導体(No.I-1)

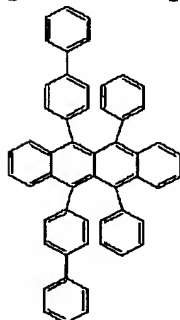


フェニルアントラセン誘導体(No.1-1)

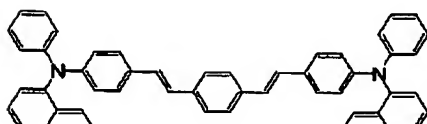


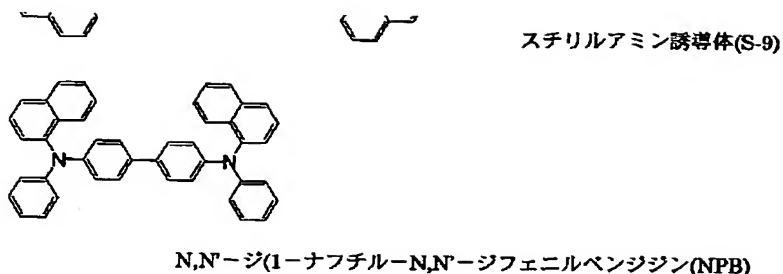
[0252]

[Formula 62]



ナフタセン誘導体(No.20)





[0253] On the <example 1> glass substrate, 100nm (anode plate) of ITO transparent electrodes was formed in the spatter.

[0254] And the glass substrate which formed the ITO transparent electrode was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. The substrate is pulled up out of boiling ethanol, and it dries, and is UV/O3. After washing, it fixed to the substrate electrode holder of a vacuum evaporation system, and the vacuum tub was decompressed to 1×10^{-4} or less Pa.

[0255] subsequently, N and N' - diphenyl-N and N' - screw [N-phenyl-N-4-tolyl (4-aminophenyl)] benzidine (HIM34) — evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 20nm, and considered as the hole impregnation layer.

[0256] They are N, N, N', and an N'-tetrakis-(3-biphenyl-1-IRU) benzidine (tetra-aryl benzidine derivative (No.1-1)) Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 20nm, and considered as the hole transportation layer.

[0257] furthermore, a tetra-aryl benzidine derivative (No.1-1), and 10, 10'-screw [2-biphenyl]-9 and 9' — a volume ratio is set to 1:3 in — BIAN thrill (phenyl anthracene derivative (No.1-1)) — as — and a naphthacene derivative (No.20) — 3.0vol(s)% — vapor codeposition was carried out to the thickness of 30nm so that it might contain, and it considered as the first mixolimnion type luminous layer. The evaporation rate at this time was made into 0.05 nm/sec, 0.15 nm/sec, and 0.006 nm/sec at order.

[0258] moreover, a volume ratio is set to 1:3 in a tetra-aryl benzidine derivative (No.1-1) and a phenyl anthracene derivative (No.1-1) — as — and a styryl amine derivative (S-9) — 3.0vol (s)% — vapor codeposition was carried out to the thickness of 50nm so that it might contain, and it considered as the second mixolimnion type blue luminous layer. The evaporation rate at this time was made into 0.05 nm/sec, 0.15 nm/sec, and 0.006 nm/sec at order.

[0259] Subsequently, with the reduced pressure condition maintained, the phenyl anthracene derivative (No.1-1) was vapor-deposited in thickness of 20nm by evaporation rate 0.05 nm/sec, and it considered as the electronic transportation layer. Moreover, tris (8-quinolinolato) aluminum (AlQ3) was vapor-deposited in thickness of 10nm by evaporation rate 0.2 nm/sec, and it considered as the electron injection layer.

[0260] Furthermore, it is CsI, with reduced pressure maintained Evaporation rate 0.05 nm/sec It vapor-deposited in thickness of 0.2nm, and MgAg (mass ratio 10:1) was vapor-deposited in thickness of 200nm by evaporation rate 0.2 nm/sec on this, it considered as cathode, 100nm of aluminum was vapor-deposited as a protective layer, and the organic EL device was obtained.

[0261] As such an organic EL device is shown in drawing 1 , it has an anode plate 2 on a substrate 1. It has the hole impregnation layer 3, the hole transportation layer 4, the first mixolimnion type luminous layer 5, the second mixolimnion type luminous layer 6, the electronic transportation layer 7, and the electron injection layer 8 in this order on it. It has the cathode which furthermore consisted of a cathode lower layer 9 formed with the alkali metal compound on this, and the cathode upper layer 10 formed with the small metal of a work function, and luminescence light is taken out from a substrate 1 side.

[0262] When this organic EL device was driven by the constant current consistency of 10 mA/cm², initial brightness was 1100 cd/m² and driver voltage 6.0V. The luminescent color was white. Moreover, the half-life of brightness was 600 hours in 2 and driver voltage 9.9V the initial brightness of 9000cds/cm at the constant current drive of 100 mA/cm², and was 50000

hours in initial brightness 1100 cd/cm² and driver voltage 6.0V at the constant current drive of 10 mA/cm².

[0263] In the component of the <example 2> example 1 instead of (a tetra-aryl benzidine derivative (No.1-1)) Use N, N'-JI (1-naphthyl)-N, and an N'-diphenyl benzidine (NPB), and also a component is obtained similarly. White luminescence is obtained when a property is evaluated similarly. By the constant current drive of 100 mA/cm² by initial brightness 9000 cd/cm² and driver voltage 9.8V It was brightness half-life 500 hours, and was brightness half-life 35000 hours in initial brightness 1100 cd/m² and driver voltage 5.5V at the constant current drive of 10 mA/cm².

[0264] In the component of the <example 3> example 1, shall not prepare the 1st mixolimnion type luminous layer, and also a component is obtained similarly. Blue luminescence is obtained when a property is evaluated similarly. By the constant current drive of 100 mA/cm² by initial brightness 8500 cd/m² and driver voltage 7.8V It was brightness half-life 500 hours, and was brightness half-life 30000 hours in initial brightness 900 cd/m² and driver voltage 6.0V at the constant current drive of 10 mA/cm².

[0265] In addition, the emission spectrum of the organic EL device of examples 1 and 3 is shown in drawing 2. The organic EL device of an example 1 shows luminescence with the blue organic EL device of white and an example 3.

[0266] The component was produced like the <example 1 of reference> example 1. However, not using the cesium iodide used as an electron injection electrode, direct MgAg was vapor-deposited on AlQ3, and it considered as the electrode.

[0267] The brightness in 10 mA/cm² became Orange luminescence of driver voltage 9.0V by 400 cd/m². When the emission spectrum was measured, 90% or more was luminescence from a naphthacene derivative (No.20).

[0268] Moreover, when the luminescence life was measured, the brightness half line of the brightness in the constant current drive of 100 mA/cm² was 4 hours in 4000 cd/m². The fall of the reinforcement of blue luminescence was especially large.

[0269] The component was produced like the <example 2 of reference> example 1. However, the luminous layer was made into the independent host of a phenyl anthracene derivative (No.1-1) from the mixolimnion host of (a tetra-aryl benzidine derivative (No.1-1)) and a phenyl anthracene derivative (No.1-1), and the naphthacene derivative (No.20) and the styryl amine derivative (S-9) were doped similarly.

[0270] The brightness in the constant current drive of 10 mA/cm² became Orange luminescence of driver voltage 7.5V by 900 cd/m². When the emission spectrum was measured, 75% or more was luminescence from a naphthacene derivative (No.20).

[0271] Moreover, when the luminescence life was measured, the brightness half line of the brightness in the constant current drive of 100 mA/cm² was 100 hours in 9000 cd/m². The fall of the reinforcement of blue luminescence was especially large.

[0272] <Example 4> [production of an organic electroluminescence display]

Scrub washing of the trade name by Corning, Inc. 7059 substrate was carried out using neutral detergent as a glass substrate.

[0273] In order to form a color filter in this substrate, spreading and the patterning process of the most common pigment-content powder type color filter as the colorization technique of a liquid crystal display were given. Red, green, and ***** are 1.0-1.5 micrometers. Spreading conditions were decided to become filter thickness and desired patterning was performed. The spin coat of the color filter material for red was carried out for about 5 seconds by 1000rpm, and it prebaked at 100 degrees C for 3 minutes. Alignment of the photo mask was carried out with the exposure machine, and 20mW ultraviolet radiation was developed after the 30-second exposure in the TMAH (tetra methyl ammonium hydride) water solution of about 0.1 mass % concentration. Developing time was about 1 minute. The cure was carried out at 220 degrees C for 1 hour so that it might not dissolve in the color filter liquid of another color applied after this, and it considered as the red color filter. About other colors, since ingredients (pigment) differed, although detailed formation conditions differed, the almost same process was performed one by one, and the color filter was formed.

[0274] Next, in order to raise the surface smoothness of the field which forms ITO after this, the overcoat material of acrylic resin was applied, desired patterning was performed, the cure was carried out at about 220 degrees C for 1 hour, and the overcoat layer was obtained. the thickness of an overcoat layer — about 3 micrometers it was .

[0275] And about 100nm of ITO(s) was formed by the spatter as transparence electric conduction film, after forming a resist pattern with photolithography, it etched with dilute hydrochloric acid, and the resist was exfoliated, and the ITO pattern was obtained.

[0276] SiO₂ is formed by the spatter as an insulator layer on ITO which carried out patterning, as remained in SiO₂ in addition to the part whose luminescence can be further seen from a glass substrate side, pattern NINGU is carried out, and it is about 0.1 micrometers about SiO₂ insulator layer. It formed in thickness.

[0277] Next, like the example 1, the organic layer, the cathode, and the protective layer of an organic EL device were formed, and white and the organic electroluminescence display which has each green and blue dot were produced. Pixel size is 2mmx2mm and the number of pixels was made into 1 dot of each color.

[0278] When the constant current drive of this was carried out by 100 mA/cm² and luminescence of each color was checked, the brightness and CIE chromaticity of each color were as follows.

[0279]

	輝度 cd/m ²	C I E x/y
白色	5 2 6 0	0. 3 2 / 0. 3 4
赤色	9 3 4	0. 6 2 / 0. 3 4
緑色	2 9 0 0	0. 3 1 / 0. 5 0
青色	7 4 4	0. 1 2 / 0. 1 4

[0280] <Example 5> [production of a simple matrix type organic electroluminescence color display]

The substrate prepared like the example 4 is fixed to the substrate electrode holder of a sputtering system, and it is about 1.5 micrometers about aluminum. The spatter was carried out to thickness, the spatter of the TiN was continuously carried out to about 30nm thickness, and the cascade screen of aluminum and TiN was formed. Since aluminum and TiN are formed continuously, without breaking a vacuum, it is prevented that the natural oxidation film is formed in the front face of aluminum layer, and good contact of aluminum and TiN is acquired. Patterning of this cascade screen was carried out with photolithography, and low resistance wiring was formed.

[0281] The color filter and the overcoat layer were formed by the same approach as an example 4. It was made for a pattern to expose the front face of a TiN layer.

[0282] And the ITO pattern as transparence electric conduction film was also formed by the same approach as an example 4. Low resistance aluminum wiring formed previously is connected now with ITO, and it becomes a column line.

[0283] SiO₂ is formed by the spatter as an insulator layer on ITO which carried out patterning, as remained in SiO₂ in addition to the part whose luminescence can be further seen from a glass substrate side, patterning is carried out, and it is about 0.1 micrometers about SiO₂ insulator layer. It formed in thickness. Useless luminescence in the part which is not visible from a glass substrate side by this is avoidable. Moreover, it can also be prevented, although the organic electroluminescence layer vapor-deposited by the inclined part becomes thin and tends to cause current leak, since this part becomes a hole thru/or a slot.

[0284] Next, it is 2 micrometers of thickness about what adjusted the concentration of polyimide to 15 mass %. The spin coat was carried out so that it might become, and it prebaked at 145 degrees C for 1 hour, and the spacer film of a midcourse phase was formed. Then, POJIREJISUTO was applied, in order to form a desired photograph pattern, negatives were exposed and developed, and the bamboo hat-like photopolymer object was formed. The spacer film of the midcourse phase of the polyimide exposed at the time of the development of POJIREJISUTO is also removed by the developer following on POJIREJISUTO, and is

formed in a final spacer configuration. Thereby, component isolation construction was formed.

[0285] Next, like an example 1, the organic layer, the cathode, and the protective coat of an organic EL device are formed, and the size of 1 pixel is 330 micrometers. x110micrometer The simple matrix type color display of a number of pixels 320x240xRGB dot was produced.

[0286] When the line sequential drive of this was carried out, color luminescence was obtained with the same CIE chromaticity as an example 4.

[0287] In the <example 6> example 4, performed alignment, and the black matrix was installed between color filters, and also the display was produced similarly. When driven similarly, a more sharp luminescence light was obtained compared with the example 4. The black matrix also used the general pigment-content powder type thing.

[0288] In the <example 7> example 4, after preparing the overcoat layer of acrylic resin, the protective coat should be further prepared for SiO₂ film on it at about 60nm thickness, and also the display was produced similarly. When driven similarly, the same result as an example 4 was obtained. Moreover, it turned out that the endurance of a component improves more.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline sectional view showing the configuration of the organic EL device in an example.

[Drawing 2] It is the graph which shows the emission spectrum of the organic EL device in an example.

[Description of Notations]

1 Substrate

2 Anode Plate

3 Hole Impregnation Layer

4 Hole Transportation Layer

5 First Luminous Layer

6 Second Luminous Layer

7 Electronic Transportation Layer

8 Electron Injection Layer

9 Cathode Lower Layer

10 Cathode Upper Layer

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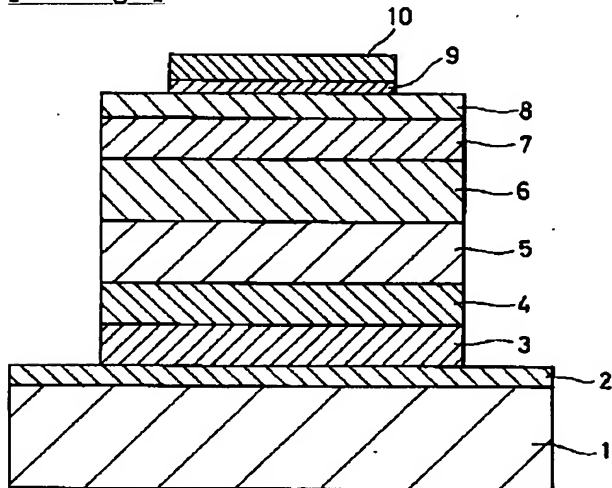
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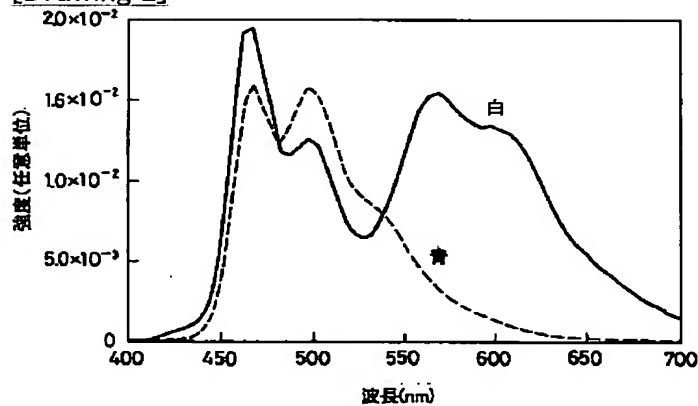
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DRAWINGS

[Drawing 1]



[Drawing 2]



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